

# Guide to California Insects.

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WOODWORTH











# GUIDE TO CALIFORNIA INSECTS

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# Guide to California Insects.

BY

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## PREFACE.

Students in entomology need an outline of the species inhabiting the region in order that they may comprehend the relationship that the special forms under consideration in the various courses bears to the whole assemblage of insects. This is the more necessary since insects affect human interests in such a variety of ways, requiring that they be studied from diverse and narrowing view points.

Those beginning the study of the subject are advised to familiarize themselves with the illustrations as the first step in gaining the desired general concept. These figures are all of local forms drawn or photographed by the author or made under his immediate direction and have been loaned for use in this publication by the Experiment Station thru the kindness of the Director.

Attention is particularly directed under each family to all the more important insects both of the local fauna and of other countries.

Synopses are presented for the identification of all the family groups and often for genera and species when of economic importance.

The synopses are arranged in an original form which the author has employed in his classes for a number of years and found to facilitate the identification of insects and to emphasize the dominant groups and their distinctive characteristics.

The plan of these synopses is to give in the order of size, the names of the leading groups, each followed by the characters distinguishing it from all that follow in the table. When the character is held in common by a larger group and by one or more smaller groups the latter are given in the same paragraph each followed by its distinguishing peculiarity.

In using the tables therefore always begin with the first group and determine whether the character applies to the insect in question, and if not, proceed to the next paragraph, wholly disregarding the characters of the smaller groups not heading a paragraph until the leading character applies and then each of the characters of the smaller groups in that paragraph must be examined.

All structures referred to in the synopses will be found explained in the general discussion of the order or family or when of general applicability in the introductory chapter and other technical terms used in descriptions are given in the appendix.

The names applied to insects have been exceedingly unstable and give a great deal of trouble even to experienced entomologists. Under each family will be found an alphabetical list of all the names that have been applied to californian insects with citations to the present accepted nomenclature.

The appendix includes many directions which will be of use both in the laboratory and in the field.

Finally such a guide as this should be kept up to date. To accomplish this the whole book is held in type so that it may be revised for each semester.

The author will appreciate very much to have the mistakes or omissions of this book brought to his attention in order that they may be rectified in the next edition. He wishes to acknowledge the help he has already received from members of his staff, particularly Dr. Van Dyke in Coleoptera, Prof. Herms with the parasitic forms of all orders, Mr. Bridwell in the Hymenoptera and Mr. Coleman in the Coccidæ. The Thysanoptera have been revised for this book by Mr. Jones.

C.W.Woodworth.

Berkeley California.

August 1913.



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## INTRODUCTION.

Insects equal in numbers of species all other living beings, both animals and plants, but systematically they constitute only one of the classes of one of the phyla into which animals are divided.

### PHYLA OF THE ANIMAL KINGDOM.

**Arthropoda:** with jointed legs operated by muscles attached directly to the skin or when legless with air tubes or tracheæ in every part of the body.

**Chordata:** with back bone or in certain aquatic members only a soft notochord between central nervous system and body cavity.

**Mollusca:** with a shell, or where this is wanting, with a well developed eye. (if shell is composed of a small and a large valve, the latter perforated, it is a Molluscoidea.)

**Echinodermata:** body radially arranged. **Cœlenterata:** with a common gastrovascular cavity.

**Protozoa:** unicellular.

**Annulata. Porifera:** many openings into digestive tract. **Platyhelminthes:** without anal opening, or with whole surface ciliate. **Molluscoidea:** ends of digestive tract near together **Trochelminthes:** with retractile anterior ring of ciliæ. **Nemathelminthes:** body unsegmented and mouth region not retractile.

Insects are by far the most important group of animals in their effects on human interests, excepting only the vertebrates in which man himself belongs. Entomologists have rendered such signal service in studying and controlling useful and harmful insects that they have generally been called upon to extend their endeavors outside of the class insecta, and to consider all similar matters in other classes or even in other phyla.

The problems in the other phyla are: for Chordata, the poisons used for killing rodents and birds, which are commonly classed with insecticides in Mollusca, the treatment of snails and slugs attacking plants corresponding with the treatment of insects doing similar injury, and among the annulata and other worms numerous parasitic forms both on plants and animals

which cannot well be separated from insect parasites.

#### CLASSES OF ARTHROPODA.

**Insecta:** winged, or one pair of antennæ and three pairs of legs, or if legless, with tracheæ.

**Arachnida:** without antennæ.

**Crustacea:** with two pairs of antennæ.

**Myriapoda.** **Onychophora:** legs not definitely jointed.

The plant feeding forms of all these classes are always treated by economic entomologists as tho they were insects, the most important group being the red spiders among the arachnida; of lesser importance are the sow bugs among Crustacea, and the millipeds of the Myriapoda.

The **Structure of Insects** is identical in its general features with that of the other classes of Articulata. The exterior of the body is hardened to give attachment to the muscles and serves as the skeleton as well as skin. The hard parts are the secretion of a delicate layer of cells called the hypodermis, which develops originally in the egg as a flat disc from which most of the organs of the body, internal as well as external, arise.

This disc is called the ventral plate because it is converted directly into the breast of the insect, cells around the edge multiplying and giving rise to the remaining parts of the body.

The first differentiation of the ventral plate is the splitting off from the inner side of two ribbons of cells which become the nervous system, lying as a double chord along the middle line beneath. These produce long slender filaments, the nerves, which grow out to every muscle and sense organ as they are developed. The cells from which these proceed gather themselves into a regular series of knots which early unite in pairs forming ganglia along the double ventral chord.

The ventral plate becomes at the same time marked off into a series of areas, one corresponding with each ganglion. As the ventral plate grows and finally closes over the back, these areas form rings or segments of the body. The cells between these areas not only become somewhat different in appearance but finally secrete a more delicate and flexible cuticle than those forming the general surface of the segment. These thin portions of the skin permit the body to bend between the segments.

Long before the segments are completed and even before the two halves of the ganglia have come together there begins an outgrowth opposite each forming ganglionic mass, showing first as slight elevations of the surface but becoming long and tubular. Soon differentiations of the cells of these processes similar to those which produce the segments, result in the production of jointed appendages as indicated by the name Arthropoda.

In the appendages which become the legs the first articulation to become evident is the knee joint. The adjacent segments are named after human anatomy, femur and tibia.

The parts of the knee joint are:—

1. The hinge consisting of a region on both sides where hardened processes from femur and tibia meet. The soft skin being very narrow at these points and folds inwardly out of the way. In the more complex knee joints like that of the grasshopper the hard parts also fold in making long hinges.
2. The guide pieces of the femur, a flat lobe on either side at the tip below the hinge and overlaying the base of the tibia when the knee is flexed.
3. The collar at the base of the tibia beginning as a crease extending over the back of the tibia from hinge to hinge and widening out in the middle like the visor of a cap.
4. The tendons, long slender infoldings of the soft skin both above and below, at the end of the tibia serving respectively the extensor and flexor muscles. These tendons usually reach almost the whole length of the femur.

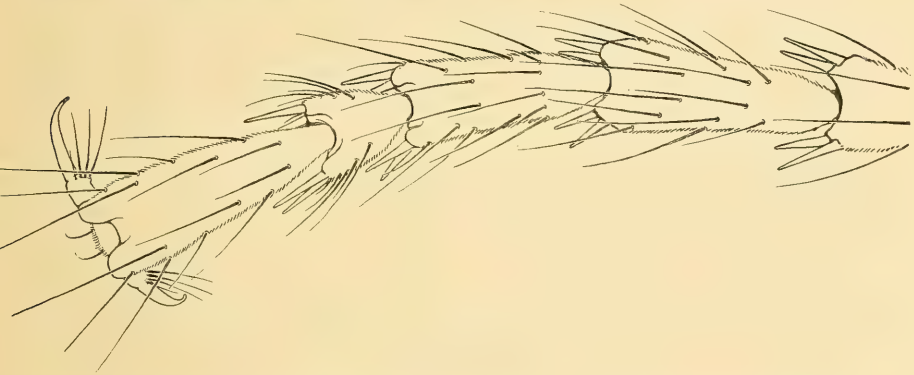


Figure 1. Foot of an ant.

5. The knee caps usually present as two hardened plates above between the ends of the femur and tibia.

Almost as soon as the knee can be made out, the structures of the foot or tarsus begin to show. In most legs there are five tarsal joints, the fifth bearing on the tip a pair of claws (ungues), between which there are a pair of pulvilli, or more commonly a single empodium, or both.

When the basal joint is enlarged it is commonly called the metatarsus.

On the end of the tibia next to the foot there are usually one or more spurs.

At the base of the leg there normally develops at least two articulations allowing motion in two directions and separating off the coxa. Between this and the femur there may be an additional segment or two, the trochanter.

Before the legs there are four pairs of appendages exactly similar at first to the rudimentary legs but each soon takes on a different shape, varying also according to the group. These appendages arise from four primitive segments of the head and are:—

1. Antennæ, usually long and many jointed. When the basal joint is long



it is called the scape. The next joint (pedicel) is usually separated from the remaining joints (flagellum) by a hinge.

2. Mandible, typically in the form of a somewhat curved cone, ending in a point or with a number of teeth. The two outer angles of the base bear the articular condyles and the soft skin of the basal articulation infolds at the inner angle into a large tendon reaching nearly to the back or top of the head.

3. Maxillæ, appendages with very complicated and varying structure. Typically consisting of two large segments (cardo and stipes) hinged together and perhaps corresponding to the femur and tibia respectively, the latter bearing the palpi corresponding to the foot but with structure more like an antenna, and the lobes called galea and lacinia, the latter within and usually sharp pointed or toothed. The stipes is often so divided as to have a sub-galea from which the lobes arise and a palpifer bearing the palpus.

4. Labium, almost identical in structure with the maxillæ but usually grown together forming a lower lip, and often with a less number of distinguishable parts. The terms mentum and submentum are commonly used instead of stipes and cardo and these terms are not used with uniformity in the different orders.

Besides the four segments represented by the appendages, from one to four additional segments have been considered by different authors as occurring in the primitive head, the best marked of which is the preantennal and the least evident the prelabial.

After the appendages begin to develop as evaginations of the ventral plate there begins an invagination at a point on the middle line at about the suture between the mandibular and maxillary segments. This passes between the commissures of the nervous system, dividing the ganglia of the head into two sets which soon unite into two compound ganglia known because of their position relative to this invagination as the supra- and suboesophageal ganglia.

At a later period a similar ingrowth from the hind end of the ventral plate produces the intestines and just before the closing in of the back of the embryo a third portion of the digestive tract is formed as a single layer of cells which envelop the remains of the yolk and finally becomes the stomach. Usually not until after the insect begins to feed are the walls broken down between these three regions making the alimentary canal continuous thru the body.

Around the digestive tract a system of muscles are developed which by constricting the tract from before backward forces the food along the canal. Irregularity in the arrangement of these muscles and corresponding differentiations of the cellular layer results in the division of the digestive tract into a series of organs as follows:—

Stomodæum.

1. Pharynx or mouth cavity, often partly closed by the thickening of the

wall, if above, the epipharynx; below, the hypopharynx. Into the mouth cavity open a series of glands of varying function but all called salivary glands. Among these are the silk glands found in a great many groups of insects. All of these glands and their ducts are produced as invaginations of the wall of the pharynx.

2. Œsophagus, a slender tube thru which the food passes rapidly. In caterpillars it is rather short but in many insects it reaches fully half the length of the body.

3. Crop or proventriculus, which receives and often holds the food for a considerable time practically unchanged. In bees this organ is the honey sac. In many insects there are large glandular pouches called cæca opening into this cavity.

4. Stomach valve, which provides for the intermittent passing of the food from the crop to the stomach. Often this region is called the gizzard when it is large and provided with a thick muscle layer. The interior cuticle may at the same time be hardened into a very elaborate system of teeth.

Mesentron.

5. Stomach, usually the largest portion of the digestive tract. The cells of the stomach wall are large and gland-like; there are no glands opening into this region, and no interior cuticular lining such as is found in all other parts of the digestive tract.

Proctodæum.

6. Ileum or large intestine, often appears as part of the stomach, the line of separation however can always be made out by the attachment of the malpighian tubes, which are long slender glands serving as excretory organs.

7. Colon or small intestine, furnished with muscles somewhat like those of the Œsophagus, passing the contents along rapidly; and in consequence this region is usually found empty.

8. Rectum, commonly marked out by the thick overlaying rectal glands and is often highly muscular with the interior wall thickened in ridges resembling somewhat the gizzard and which serves as a filter pump to extract the liquid portion of the contents before passing the solid portion out.

The most elaborate system of internal organs are the tracheæ or air tubes. They are called tracheæ because of a general resemblance in function and structure to the wind pipe in human anatomy. There are no organs in the body of an insect comparable to the lungs, the tracheæ taking the air directly to every part of the body. In aquatic insects the original openings may finally close, and the exchange of oxygen and carbonic acid with the surrounding water is made thru tracheal gills.

Tracheæ develop as invaginations of the body wall in quite a late stage

in the development of the embryo, a few cases being known in which they are not developed so as to be functional at hatching. The invaginations are formed on either side of the segment. Some of the segments always fail to produce tracheæ and in such cases the tracheæ of adjacent segments supply the lack. The parts of the tracheal system are as follows:—

1. Spiracles or stomata, at the point of invagination there usually develops an elaborate structure bordered by one or more chitinous rings, within which dense combs of spines stand guard over the slit-like opening. Within the body the trachea may expand into a subspherical chamber and may be provided with chitinous bars with muscle connections enabling the insect to completely close the opening.

2. Spiracular trunks, being the portion of the tracheal system developed before the proximity of the digestive tract resulted in the stopping of the growth at the tips of the invaginations and the beginning of growth at two points like adventitious buds for the production of the lateral trunks.

3. Lateral trunks, resulting from the joining of the whole series of out-growths on a side into one long tube extending almost from end to end of body. The points of union are at first closed just as are those of the three regions of the digestive tract and there always remains at these points a ring of entirely different structure from the surface of the tracheal wall.

4. Dorsal and ventral girdles, developing at various points along the lateral trunks, and varying greatly in number and position in different insects. These arise as pairs of large tracheal trunks growing around the digestive tract, meeting and joining in the same way that the elements of the lateral trunks grew together.

5. Branches, which arise at various places along any of the trunks, but chiefly at or near the point where the first forking occurred which subdivide into a great number of very fine thread-like tubes which proceed to invade every tissue and organ and show no tendency to anastomose.

There are in addition to the digestive tract and tracheæ numerous glands opening thru the skin in various parts of the body in different insects, which arise as invaginations of the skin, usually rather late in the development of the insect. The ducts of the sexual organs also belong to this category. There is first produced a pair of invaginations which are finally pinched off entirely from the skin and finally attach themselves to the end of a single median ingrowth. The first egg therefore passing out from the ovary must first break thru its own investment of connective tissue and into one of the lateral ducts and then thru the walls separating this from the common duct. A special organ to tear the way thru these tissues is developed below the lowest egg in an ovariole.

The sense organs of insects consist of:—

1. Eyes located on the head, usually a pair of compound eyes and three simple eyes.



2. Ears in the form of tympanal organs, found only in a comparatively small number of insects, on the base of the abdomen in grasshoppers and on the base of the front tibiæ in katydids and crickets.

3. Modified hairs with a great variety of functions which may be grouped into two classes, (a.) long hairs chiefly serving as organs of touch, certain of them vibrating with definite tones are believed to be organs of hearing. (b.) very much shortened hairs, often almost completely suppressed, retaining and specializing however, the basal structures. These respond to chemical stimuli and may be roughly classed into organs of taste and smell, according as they respond to the contact of liquids or gasses. Many different kinds of these modified sense hairs or pits may occur on the same insect indicating perhaps the possession of senses unknown to us.

Besides the cells which took part in forming the ventral plate there were other cells in the embryo which remained in the yolk or only attached themselves to the inner surface of the ventral plate. From these the blood-cells, connective tissue, fat bodies and muscles arise. The blood cells correspond with the white blood corpuscles, nothing existing in insects comparable with red blood cells. Connective tissue forms a thin investment over all the organs. When invaded by a nerve it develops into a muscle, and when storing an inordinate amount of food material it is a fat body.

Since the skeleton of an insect is external it is necessary to cast off the skin from time to time to provide for the increasing size. This molting process is quite complicated. The following steps may be recognized:—

Preliminary.

1. Storing food to repletion.
2. Growth of skin epithelium, increase in both number and size of cells.
3. Emptying of digestive tract.

Somnus.

4. Detachment of epithelium and muscles from cuticle thru the secretion of a fluid as in a blister involving the withdrawal of the contents of the harder parts, (claws, head of caterpillars, etc.)

5. Completion of epithelium over ends of muscles.

6. Secretion of expansion layer which becomes much wrinkled thus providing for enlargement of skin surface.

7. Deposition of new cuticle against expansion layer, largely exhausting the epithelial cells.

8. Regaining of muscle attachment to skin.

Molt.

9. Muscle action pulling legs and abdominal parts into thorax.

10. Bursting of old cuticle from internal pressure, along back of thorax.

11. Emergence of the insect.

Concluding processes.

12. Completion of expansion of wrinkled parts by blood pressure produced by filling the air sacs and by the contraction of the muscles of the body wall.

13. Hardening of cuticle on exposure to the air.

14. Beginning of feeding.

15. Completion of oxidization of skin pigment.

Metamorphosis is the term used to express the changes an insect undergoes from the time it hatches from the egg until it assumes the adult condition.

In the more primitive insect it is not very striking. In those that possess

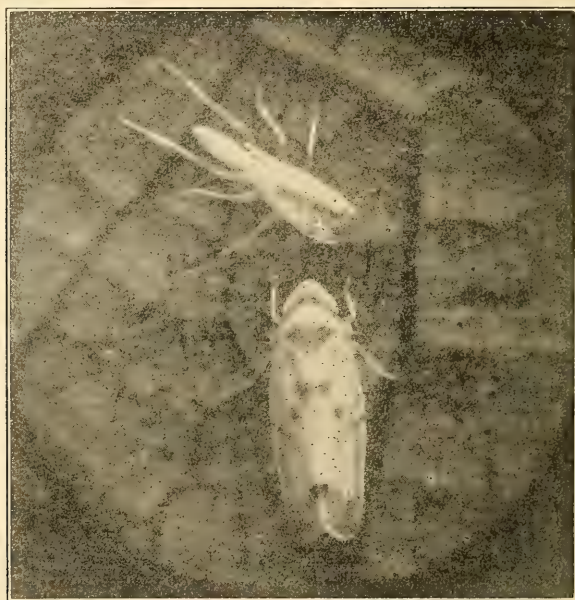


Figure 2. Photograph of a vine hopper just molted, and of the skin from which it came.

wings the change on becoming adult is very much more evident. The somnus just preceeding the last molt is longer and the whole thoracic structure is reorganized to provide the hinge and musculation necessary for flight. When the change to the adult becomes so profound as to extend the somnus over the ertire instar preceeding the acquirement of adult structures we have a third type of metamorphosis. This inactive and non-feeding stage, the pupa, usually becomes very different externally from the larva. The development of complex metamorphosis permits a simultaneous improvement in the adaptation of both the young and the adult insect. Insects having this kind of metamorphosis greatly outnumber all others.

Hypermetamorphosis arises in a similar way among certain beetles for the better adaptation of the very young and the older larval stages.

The wings of insects are of necessity limited to the last stage because provision for molting cannot be made in an organ delicate enough to serve for flight. Wings are so complicated and so useless for this function until they are large organs with hinge and muscles that they must have arisen as an organ for another purpose. Aquatic insects often possess gills somewhat similar to wings in structure, and such organs are generally considered as the precursor of the wings. An intermediate stage between the gill and the wing is presented in the wing-like gill covers of certain May-fly nymphs. The most important structures in the wing are the strengthening ribs called veins. The following elements of a venation can be distinguished:—

1. Marginal veins, always present on both edges at the extreme base, sometimes extending all around the wing. The anterior marginal connects

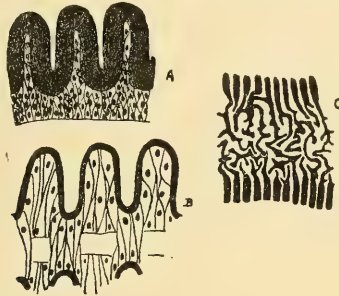


Figure 3. Section of a wing showing the folding of the cuticle just before the final molt. A. section of vein. B. of membrane. C. tangential section showing the wrinkling of the membrane in both directions.

with the tendon which pulls the wing from the rest position, the posterior is continuous with the hind edge of the segment.

2. The primary vein, extending across the wing in front of the middle and at base bearing the lower articular condyle. This vein is also invariably present in functional wings.

3. The anterior and posterior veins, variable in number, usually one anterior and two or three posterior.

4. The independent veins and branches, occupying the spaces in the outer portion of the wing between the veins previously mentioned. They probably all arose as independent veins tho many became attached as branches.

5. Cross-veins, probably developing spontaneously over the wing surface

A theory of venation very largely accepted, derives the veins directly from the tracheæ of the gill and bases a nomenclature upon a theoretical primitive number and arrangement of these structures. As first presented there were supposed to be eleven of these veins but all the even numbers were



Figure 4. The five instars of the vine hopper.

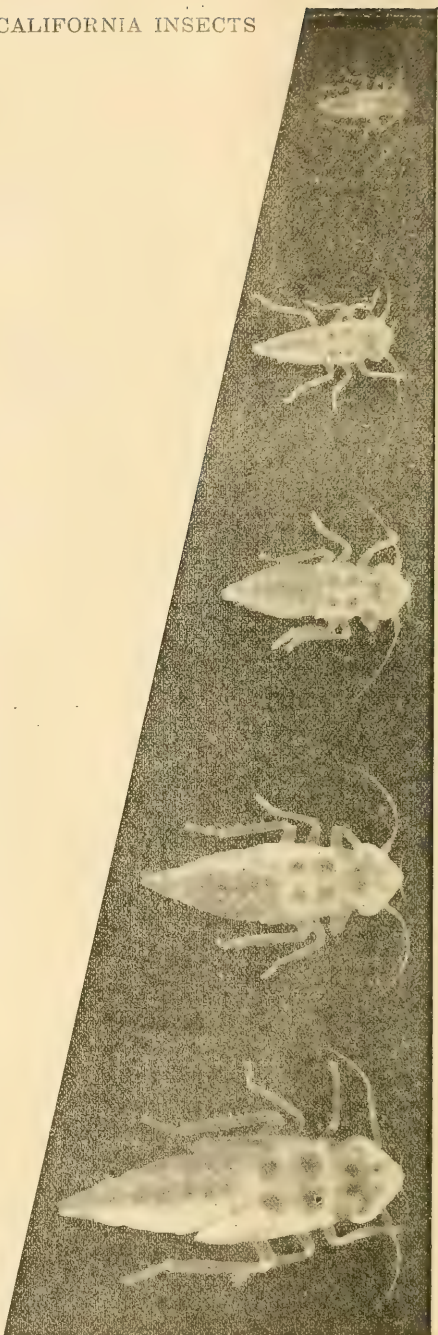
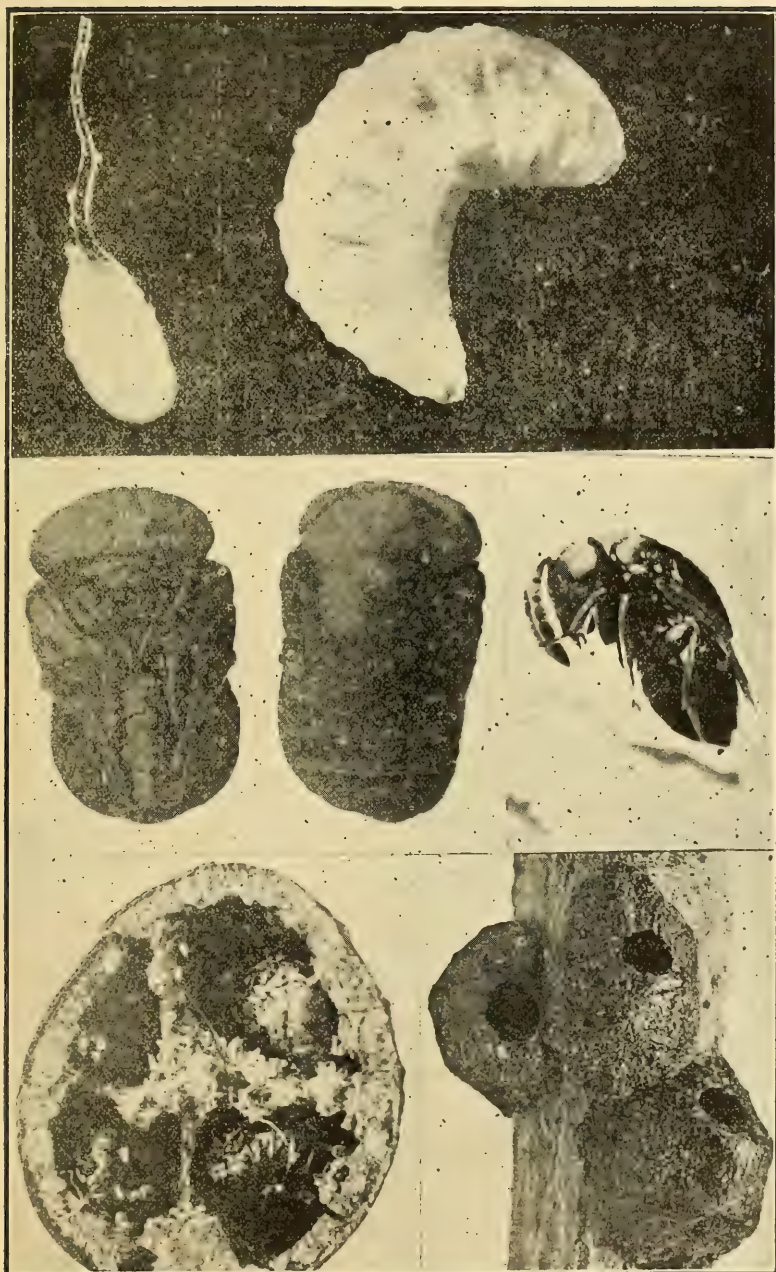


TABLE OF INSECT METAMORPHOSES.

Primitive	Simple	Complex	Hyper-	Feeding	Instars	Stages
Egg.	Egg.	Egg.	Egg.	No.	One.	Egg.
			1st. larva.	Yes.	One or more	1st. larva.
			Pseudo-pupa	No.	One.	Pseudo-pupa
		Larva.		Yes.	Several.	Larva.
			2nd. larva.	Yes.	One or more.	2nd. larva.
	Nymph.			Yes.	Several	Nymph
		Pupa.	Pupa.	No.	One.	Pupa.
				Yes.	Several.	Insect
Insect.	Imago.	Imago.	Imago.	Yes.	One.	Imago..



and remaining numerous in the older groups of insects but in the more modern orders only a few of these are left, tho remaining a very important element of the venation.

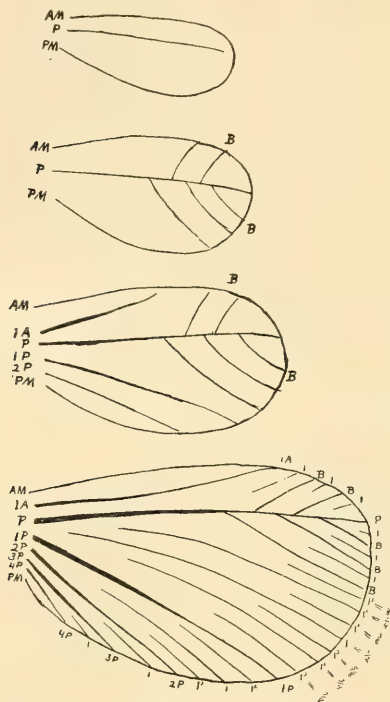


Figure 7. Diagram showing possible stages in the development of a venation. A. primary vein. AM. anterior marginal. PM. posterior marginal. 1A. anterior. 1-4 P. posteriors. I. independents. B. branch.

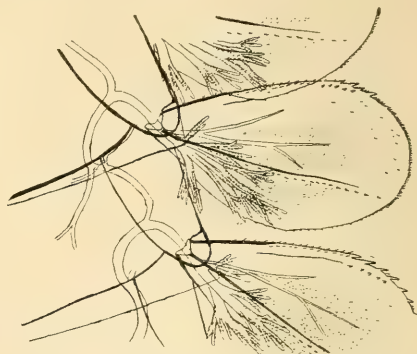


Figure 6. Portion of the abdomen of an ephemerid nymph showing three tracheal gills with wing-like gill covers and traces of venation.

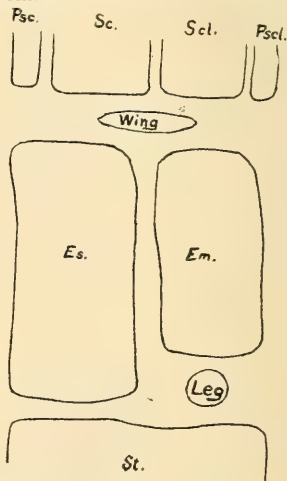


Figure 8. Diagram of thoracic structure. Psc. præscutum. Sc. scutum. Scl. scutellum. Pscl. postscutellum. Es. episternum. Em. epimeron. St. sternum.

Figure 5. (Opposite page.) Complex metamorphosis, the development of *Scutellista cyanea*, a parasite of the black scale. Beginning to the left above, the figure shows egg, larva, pupa (back and side views), imago black scale overturned showing four larvæ, and two black scales showing exit holes made by the parasite.



soon dropped out leaving six, and names substituted for the numbers as follows:— I. subcostal, III. radius, V. media, VII. cubitus, IX. and XI. anal veins. Three of these were supposed to be simple, III. five-branched V. four or three-branched, and VII. two branched. The radius is the primary vein, the media and all the branches independents. Cross-veins have no place in the system.

There are a number of distinct systems of nomenclature used in the different orders as will be explained as each group is considered.

The thorax consists of three segments known as the pro- meso- and meta-thorax and these prefixes apply also to all the parts of which each segment is composed. The parts of a segment are: a single piece beneath—the sternum; two on either side— episternum in front and epimeron behind; and four sclerites on the back— the præscutum, scutum, scutellum and postscutellum. The theory has been suggested that they represent vestiges of four primitive segments, but it seems more likely that the development of legs and wings has caused the differentiation from a simple segment. The sutures seem to be in the nature of infoldings to give greater strength where the insertion of the leg weakened the segment and where the pull of the leg muscles needed greater resistance.

The legs may thus be held responsible for the cutting off of the sternum and the dividing of the upper portion into an anterior and a posterior portion. The development of the wing results in a more complete cutting off of the dorsal portion of the segment. The præscutum and postscutellum may be chitinizations of the intersegmental membrane to give attachment and resistance to the great muscle of flight.

The great longitudinal wing muscle which causes the down stroke of the wing by arching up the back connects the anterior ends of segments; thus the hind wing muscle reaches from the metathorax to the first abdominal segment. Where there is a great constriction at the base of the abdomen it is necessarily between the first and second segment. The first abdominal segment is therefore often counted as one of the thoracic segments.

Very early in the history of winged insects provision was made for doubling the wing back against the body when not in use. The Odonata and Ephemera are the only existing groups in which the wings are rigidly attached to the wing roots. In all other cases we can notice:—

1. The articulation of the base of the anterior marginal, and the development of a tendon for direct muscular attachment.
2. The basal interruption of all veins except the posterior marginal and the primary or their fusion with the base of the primary.
3. The formation of at least one folding area involving all the base of the wing back of the primary, including the posterior marginal vein.

Associated with the complication of the base of the wing there is an entirely new plan of musculation. In the Odonata the tendon of the elevator muscle



capital letter.

2. Species name, usually a Latin adjective agreeing in gender with the genus name and never written with a capital except when derived from a proper name and usually not even then.

3. Authority, the name of the first describer of the species, usually abbreviated and inclosed in parentheses if the species was not originally placed in the proper genus.

When varieties or subspecies are indicated, the name is formed precisely like the species name and given immediately after it followed by the authority of the variety and not that of the species. Sometimes the variety is considered subordinate to subspecies, and then the varietal name stands

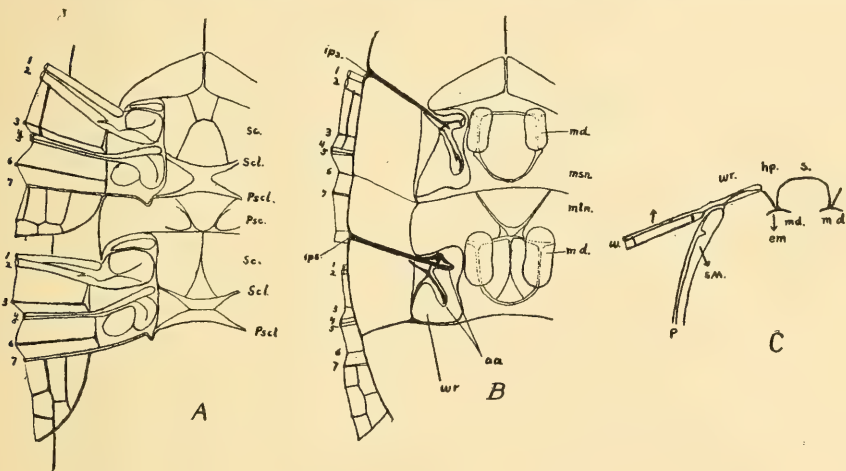


Figure 11. Wing attachment in *Aeschna*. A. dorsal view. B. view from within. C. section. Letters as in figure 8. aa. articular condyle. w. wing. wr. wing root. awr. anterior wing root. pwr. posterior wing root. md. muscle disk. msn. mesonotum. mtn. metanotum. hp. hinge fold. em. elevator muscle. dm. depressor muscle.

fourth and the authority fifth.

Groups higher than species are often called subgenera. Such names are formed precisely like generic names and given in parentheses between the genus and species name.

Names of groups higher than genus never appear as part of the name of a species and are almost uniformly derived from genus names by the substitution of a termination as *-idæ* for family and *-inæ* for subfamily *-idea* has served for superfamily, tho the shorter *-ina* is to be preferred.

Order names are not derived from generic names, tho most of them have the common ending *-ptera*.



The primary classification of insects into orders was originally based on the wings, beginning with the horny winged beetles and ending with the wingless forms. Next the method of taking food was made the basis of separation into two great groups, the biting and the sucking insects. This has of late been largely replaced by a division based on the development those with primitive and simple metamorphosis in one series and those with complex and hypermetamorphosis in the other. None of these plans seem wholly satisfactory; that adopted in this book is chronological, that is the orders are given in the sequence of their appearance on earth as shown by the geological record.

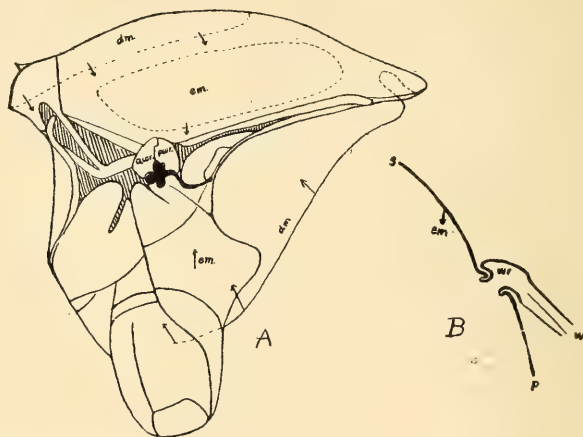


Figure 12. Wing attachment in Cicada. Letters the same as Figure 10.

The table following gives the original Linnæan system and that given in five recent textbooks. Folsom alone separates the Collembola from the Aptera and Comstock alone the Euplexoptera from the Orthoptera. Both Comstock and Kellogg separate the Mallophaga and Isopoda from the Corrodentia, and Comstock and Folsom the Siphonaptera from the Diptera. The author differs from the majority regarding Thysanoptera tho all agree as to its location in the series. He differs from all five by placing the Neuroptera and allied forms with the Plecoptera, agreeing rather with most of those who have specially studied these groups in the belief that they are very closely allied despite the difference in metamorphosis. If these groups were made distinct orders, the historical arrangement would place Neuroptera just below Coleoptera, the Mecoptera below Diptera and Trichoptera antedating Hymenoptera and Lepidoptera.

The placing of Ephemerida lowest of the winged insects by Comstock

and Kellogg is based on the theory that many veined wings antedated those with few veins and corresponds with the idea of eleven primitive veins.

The placing of Orthoptera lowest by Folsom and Sanderson follows those who do not think that wings arose as tracheal gills or in aquatic insects.

The arrangement of the four largest and most recent groups, Coleoptera, Diptera, Hymenoptera and Lepidoptera is given differently by each author with no very evident reason.

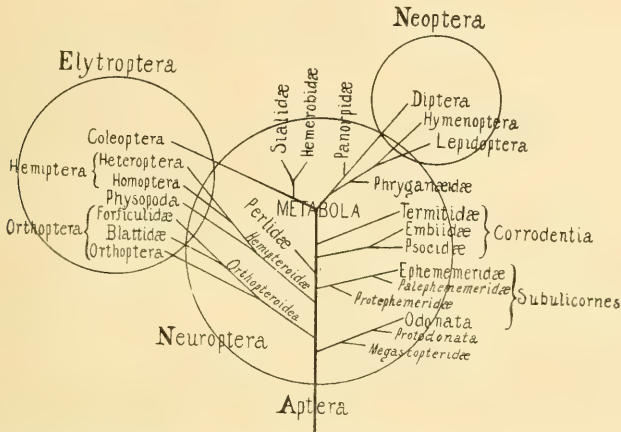


Figure 13. Diagram of the genetic relationships of the groups of insects and the three types of venation.

#### ORDERS OF INSECTS.

**Coleoptera:** spiracles and dorsal abdominal segments not visible from beneath.

**Lepidoptera:** densely covered with scales.

**Diptera:** hind wings club-like, or if wingless, thorax separated by constrictions from head and from abdomen, and without opposable jaws.

**Hymenoptera:** wings hooking together and front wings very narrow near the base, or if wingless, greatly constricted at base of abdomen.

**Hemiptera:** mouthparts tubular, or with long threadlike lancets, or very unsymmetrical, or wanting.

**Orthoptera:** front wings leathery, or if wingless, either front or hind legs are much enlarged, or body is flattened, or thorax is very slender cylindrical.

**Corrodentia:** ant-like or louse-like.

**Neuroptera. Odonata:** wings notched near the middle of the front edge. **Aptera:** wingless and legs shorter than body. **Ephemera:** with three tails.

Table showing the Classification of Insects into Orders.

Orders of insects as given in this book.	1758 Linnaeus.	1894 Constock.	1897 Smith.	1906 Folsom.	1905 Kellogg.	1913 Sanderson	Genera typical of all groups ever given rank as Orders.
1. Aptera.	7	1*	1	1*	1*	1	Lepisma. 1806 Machilis Latr. 1864 Japyx Halid. 1824 Campodea W.
Collembola.				2			Podura. 1806 Smynturus Lat.
2. Neuroptera.	4	12	3	10	11	3	Hemerobius. 1834 Coniopteryx C. Raphidia. 1803 Sialis Latr.
Mecoptera.		13		11	12	4	Panorpa.
Trichoptera.		14		12	13	5	Phryganum.
Plecoptera.	(4)	4	2*	5	3	7	1764 Perla Geof..
3. Odonata.	(4)	3	(2)	7	4	8	Libellula.
4. Ephemera.	(4)	2	(2)	6	2	6	Ephemera.
5. Corrodentia.	(7)	6	(2)	4*	6	9	1797 Psochus Latr.
Mallophaga.		7			7		1818 Menopon. Nitz.
Isopoda..		5			5		Termes. 1825 Embia La r.
6. Orthoptera.	(1)	9	4	3	8	2	Gryllus. Mantis. 1795 Phasma Licht. 1871 Hemimerus W.
Euplexoptera.		8					Blatta. Forficula.
7. Hemiptera.	2	11	5	9	9	10	Notonecta. Coccus. Aphis. Cicada. Thrips.
Thysanoptera.	(7)	10*		8	10		Carabus. 1802 Stylops Kirby. 1869 Platypsilla W.
8. Coleoptera.	1	18	6	14	14	11	Musca. Hippobosca. Pulex.
9. Diptera	6	16	9	15	15	13	Apis.
Siphonaptera.	(7)	17		16			Papilio.
10. Hymenoptera.	5	19	8	17	17	14	
11. Lepidoptera.	3	15	7	13	16	12	

1\* Thysanura. 2\* Pseudoneuroptera. 4\* Platyptera. 10\* Physopoda.



## LEPIDOPTERA.

The last of the orders of insects to appear on earth is the one comprising the moths and butterflies, these latter developing simultaneously with flowering plants and are generally conceded to be the most beautiful members of the class. The beauty of coloring is due to pigment in the scales which cover the body and which are developed to a degree not found in any other order. The pattern is always in mosaic the units of which are so small as rarely to be seen except under the microscope. The distinction between species is almost invariably based on the color pattern. Specimens that are battered and have lost a considerable portion of their scales therefore

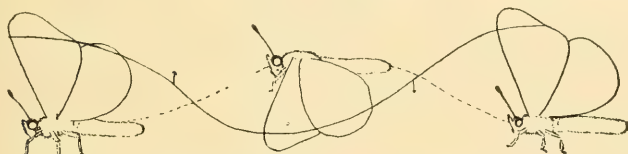


Figure 14. Diagram showing the flight of a butterfly.

become often quite unidentifiable.

The most important characters for the classification of these insects are afforded by the venation of the wings. This is often quite hard to make out however because of the scales and can be best studied by bleaching the wings (see appendix.) Most of the features can generally be determined by examining the wings from beneath. The commonest nomenclature for the veins is to number them in order from behind forward using 1a. and 1b. when there are two veins behind the large cell instead of one as is usual.

A plan of wing formulæ has been devised, based on the common system of nomenclature but applying the numbers to the connecting veins or bars instead of those proceeding to the margin; bar 2 being between veins 1 and 2. When veins fork from a common stem it is indicated by an \* thus 8\* is the common stem of 7 and 8. The formula consists of a list of the bars

in the order of size, enclosing in parentheses those of approximately equal size. The use of such formulæ greatly facilitates identifications.

The following formulæ show the venation of our common larger butterflies.

<i>Parnasius clodius</i>	11 2 8* 10 6 3 4 5 9 7*
<i>Papilio eurymedon</i>	12 2 8* 5 3 4 6 7 10 11 9
<i>Neophasia menapia</i>	11 2 8* 7* 3 5 4 10 6 9
<i>Pontia rapæ</i>	10 2 7* 3 6 4 9 8 6
<i>Synchlœ ausonides</i>	12 2 (7* 8*) 3 5 9 11 4 6 10
sara	12 2 (8* 9*) 3 11 5 4 10 6 7
<i>Callidryas eubule</i>	11 2 10 3 5 8* 4 7* 6 9
<i>Zerene eurydice</i>	11 2 8* 10 7* 3 5 4 6 9
<i>Eyrymus eurytheme</i>	11 2 8* 7* 10 5 3 4 6 9
<i>Eurema nicippe</i>	11 2 8* 10 3 5 7* 4 9
<i>Agraulis vanillæ</i>	12 2 10* 3 8* 9* 5 4 6 7 11*
<i>Argynnis liliana</i>	12 2 (3 9*) 8* 11 (4 5) 6 10 7
<i>Brenthis epithore</i>	12 2 10* 3 9* (5 8*) 4 6 11 7
<i>Lemonias chalcedon</i>	12 2 3 8* 5 9* 11 6 4 10 7
<i>Phyciodes pratensis</i>	12 2 8* 9* 10* 3 5 11 6 4 7
<i>Polygonia faunus</i>	12 2 9* 3 8* 5 4 6 11 10 7
<i>Eugonia californica</i>	2 12 9* 8* 3 5 11 4 6 10 7
<i>Eu Vanessa antiopa</i>	12 2 9* 8* 5 3 11 4 6 10 7
<i>Vanessa atlanta</i>	12 2 9* (3 5) 8* 4 11 6 10 7
carye	12 2 9* (3 5) 8* 4 6 11 10 7
<i>Junonia cœnia</i>	11 2 9* 8* 10 7
<i>Basilarchia lorquini</i>	12 8* 2 9* 5 3 11 6 10 4 7
<i>Limitis bredowii</i>	12 2 10* 8* 5 9* 6 10 4 7
<i>Cœnonympha californica</i>	12 2 9* 8* 5 3 4 6 11 10 7
<i>Anosia plexippus</i>	12 2 8* 9* 3 4 5 11 6 7 10
<i>Chrysobia virgulti</i>	11 2 8* 3 5 6 9 10 6 4 7
<i>Uranotes melinus</i>	10 2 3 8 9 5 6 4 7
<i>Callophrys dumetorum</i>	10 2 3 9 8 5 6 4 7
<i>Gæides xanthoides</i>	2 10 9 3 5 6 4 8 7
<i>Epedemia belloides</i>	11 2 8* 10 3 5 9 4 6 7
<i>Rusticus acmon</i>	11 2 8* 3 9 10 4 6 5 7
<i>Cyaniris ladon</i>	11 2 8* 3 5 9 6 10 7 4
<i>Erynnis comma</i>	11 2 3 9 10 4 7
<i>Brephidium exilis</i>	10 2 3 5 9 8 7 6 4
<i>Thanaos tristis</i>	12 3 2 11 4 10 6 5 9 7 8
<i>Hesperia tessellata</i>	12 3 2 11 10 5 6 4 7 9 8

Almost the only other characters besides those afforded by the wings are those of the mouth. This differs radically from that of other insects. The mandibles are wanting or represented by the merest rudiments in a few moths. The labium is usually represented by a pair of strongly developed palpi and the maxillæ have combined to form a single tube which at rest lies

coiled up is a spiral between the palpi. In some of the lower moths the maxillary palpi are also present. The characters used in classification are the relative size, position and clothing of the three-jointed palpi.

The larvæ of Lepidoptera have usually 16 legs, the first two and the next to the last abdominal segments being legless. Some have a less number by the loss of the more anterior pairs of abdominal legs, the minimum number being ten. All abdominal legs differ in structure from the thoracic legs, and are often called pro-legs.

The pupæ have the appendages cemented fast to the body except in a few of the lowest moths.

The classification of Lepidoptera of longest standing is the separation



Figure 15. The head and mouthparts of a larva of a moth.

of the diurnals, butterflies, from the moths. Another division commonly made is the separation of the smaller forms as microlepidoptera. Recently the forms possessing a finger-like projection (jugum) near the base of the hind edge of the front wing have been placed by themselves as the jugatae. The families Sphingidæ and Saturnidæ comprising our largest moths have each been separated as primary groups.

#### SYNOPSIS OF FAMILIES.

**Noctuidæ:** cell of front wings closed by a cross-vein in three sections, a large feeble semicircular portion followed by two small, nearly equal transverse portions. **Agaristidæ:** antennæ: enlarged outwardly. **Nycteolidæ:** front wings not arched at base.

**Geometridæ:** two large, nearly equal sections of cross-vein at end of cell



and antennæ not knobbed at tip. **Notodontidæ**, and **Bombycidæ**: anterior vein almost straight near base, the latter without proboscis.

**Pyralidæ**: hind wings with posterior area distinctly wider than the costal and median areas combined.

**Tortricidæ**: costal area of front wings wider than cell, and palpi obtuse.

**Lycænidæ**: antennæ knobbed and eyes not further apart than half their vertical height. **Riordinidæ**: anterior vein forked near base.

**Nymphalidæ**: antennæ knobbed and front legs much smaller than others. **Agapetidæ**: some of the veins greatly swollen near base. **Lymnadidæ**: with small cell between anterior vein and its basal branch.

**Tineidæ**: head rough haired or antennæ with basal eye cap.

**Pterophoridæ**: wings divided plume-like.

**Hesperidæ**: antennæ knobbed and far apart at base.

**Gelechiidæ**: anterior vein of hind wings connected with cell, and three veins beyond the posterior vein. **Xylorictidæ**: outer branch of primary vein of hind wing not reaching the costa.

**Hyponomeutidæ**: wings of nearly equal size, hind wings not heavily fringed.

**Arctiidæ**: anterior vein of hind wing arising from middle of cell. **Lithosiidæ**: without ocelli.

**Pieridæ**: antennæ knobbed. **Papilionidæ** and **Parnassiidæ**: inner edge of hind wings concave; the former has long tails on hind wing.

**Ecophoridæ**: wings narrow oval or lanceolate, primary not approximate but nearly parallel with independant vein in hind wing. **Blastobasidæ**: fringe of front wing making inner edge appear concave.

**Elachistidæ**: wings narrow oval or lanceolate.

**Sphingidæ**: end of cell of front wings very oblique.

**Sessiidæ**: cell of front wing open. **Thyridæ**: two independents connected with posterior vein in front wing.

**Saturnidæ**: cell of front wing less than half the length of the wing. **Lasio-campidæ**, **Nolidæ** and **Dioptidæ**: the first two with posterior vein of front wing apparently four-branched, and the last two having frenulas.

**Hepialidæ**: independent veins crossing cell of front wing. **Micropterygidæ**: cell open. **Cossidæ** and **Psychidæ**: no jugum on front wing, the former with wings spotted.

**Syntomidæ**. **Thyatiridæ**: with posterior vein of front wing apparently three-branched. **Platypterygidæ**: cell of hind wing much shorter on anterior side. **Liparidæ** and **Pericopidæ**: primary and independent veins of hind wings stalked, the latter with large spots on wing.

### *PAPILIONINA — Butterflies.*

Literature:— Holland, *Butterfly Book*. Wright, *Butterflies of the West Coast of the United States*.

#### **PARNASSIIDÆ.**

These butterflies live in the Sierras, the larvæ feed on *Sedum* and *Saxifraga*.

*Parnassius baldur*—*clodius*.  
*behrii*—*smintheus*.  
*clarius*—*clodius*.  
*clodius* Men.

*menetresii*—*clodius*.  
*nomion* (Alaska.)  
*smintheus* Edw.

## PAPILIONIDÆ.

Swallow tail butterflies, the larvæ mostly feeding on Umbelliferæ, but *L. philenor* feeds on *Aristolochia*, *P. eurymedon* on *Rhamnus californicus* and *P. rutulus* on willow, alder and apple.

*Euplædes troilus*—*Papilio*.

*Jasoniades daunus*—*Papilio*.

*eurymedon*—*Papilio*.

*pillumnus* (not California.)

*rutulus*—*Papilio*.

*Leartius arcelisaurus* (not California.)

*mylotes*—(not California.)

*philenor* (Linn.)

*Papilio americanus* Koll.

*asterias*—*polyxenes*.

*bardii* (Edw.)

*californica*—*zolicon*.

*caladon* Lucas.

*danus* (not California.)

*eurymedon* Boisd.

*hirsuta* skin.

*indra* Reak.

*machaon* Linn.

*mylotes* (not California.)

*pergamus*—*indra*.

*philenor*—*Leartias*

*polyxenes* Fabr.

*rutulus* Boisd.

*troilus* (not California).

*zolicon* Boisd.

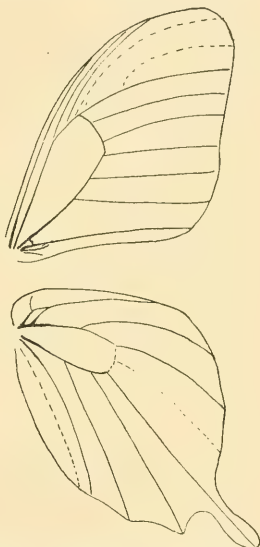


Figure 16. Diagram of butterfly venation. Dotted lines indicate veins sometimes absent.

## PIERIDÆ.

The only family of butterflies containing highly injurious species, includes the beautiful orange tipped butterflies *Synchlœ*, the white butterflies *Pontia* and a number of genera of yellow forms.

## SYNOPSIS OF GENERA.

*Eurymus*: color yellow. *Nathalis*: black dash on hind edge of front wing. *Callydrias*: without black markings. *Zerene*: with only a black dot at end of cell in female, and nearly half the wing black in male. *Eurema*: black band on wing not tapering at each end.

*Synchlœ*: wings conspicuously mottled beneath.

*Pontia*. *Neophasia*: with distinct black mark on costa to end of cell.

*Anthocharis angelina*—*Synchlœ cethura*.

*ansonina* (not California).  
*ausonides*—*Synchlœ*.

caliente *Synchlœ*.  
 cooperi—*Synchlœ cethura*.  
 cethura—*Synchlœ*.  
 creusa—*Synchlœ*.  
 edwardsii—*Synchlœ lanceolata*.  
 hyantis—*Synchlœ ausonides*.  
 lanceolata *Synchlœ*.  
 lotta (not California).  
 morrisoni—*Synchlœ cethura*.  
 reakirtii—*Synchlœ sara*.  
 sara—*Synchlœ*.  
 stella—*Synchlœ sara*.  
*Callidrias eubule* (Linn.).  
*Colias adriane*—*Eurymus eurytheme*.  
 alexandra—*Eurymus*.  
 amphidisca—*Eurymus eurytheme*.

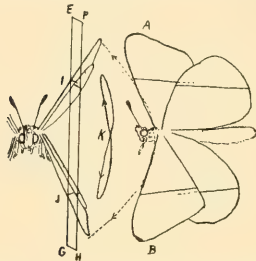


Figure 17. Diagram illustrating the flight of a butterfly. A. wing elevated. B. wing depressed. EFGH, plane cutting wing at I. K. projection of path of I.

barbara—*Eurymus harfordi*.  
 behrii—*Eurymus*.  
 cæsonia—*Zerene*.  
 californica—*Eurymus eurytheme*.  
 chrysomelas—*Eurymus occidentalis*.  
 chrysthos theme (not California).  
 edusa—*Eurymus eurytheme*.  
 edwardsii—*Eurymus*.  
 emelia—*Eurymus alexandra*.  
 eurydice—*Zerene*.  
 eurytheme—*Eurymus*.  
 hagenii—*Eurymus eurytheme*.  
 harfordi—*Eurymus*.  
 hyale (not California).  
 interior (eastern).  
 keewadin—*Eurymus eurytheme*.  
 occidentalis—*Eurymus*.  
 phylodice (eastern.)

rutilans (undetermined).  
 scudderi—*Eurymus*.  
 wosnesenski—*Eurymus*.  
*Eucherra menapia*—*Neophasia*.  
*Euchlœ ansonoides*—*Synchlœ*.  
 cethura—*Synchlœ*.  
 creusa—*Synchlœ*.  
 lanceolata—*Synchlœ*.  
 sara—*Synchlœ*.  
*Eurema nicippe* (Cram.)  
*Eurymus alexandra* (Edw.)  
 behrii (Edw.)  
 emelia—*alexandra*.  
 eurytheme (Boisd.)  
 harfordi (Edw.)  
 interior (eastern.)  
 occidentalis (Scud.)  
 phylodice (eastern).  
 scudderi (Reak.)  
*Gonepteryx rhamni*—*Zerene eurydice*.  
*Meganostoma cæsonia*—*Zerene*.  
 eurydice—*Zerene*.  
*Midea lanceolata*—*Synchlœ*  
*Nathalis iole* Boisd.  
*Neophasia menapia* Feld.  
 terlooii Behr.  
*Papilio eubule*—*Callidrias*.  
 cæsonia—*Zerene*.  
 nicippe—*Eurema*.  
 napi—*Pontia*.  
 rapæ—*Pontia*.  
*Pieris ansonia* (not California).  
 autodice (not California).  
 beckeri—*Pontia*.  
 calyce—*Pontia occidentalis*.  
 castoria—*Pontia napi*.  
 chloridice—*Pontia beckeri*.  
 flava—*Pontia napi*.  
 lanceolata—*Synchlœ*.  
 leucodice (not California).  
 marginalis—*Pontia rapæ*.  
 menapia—*Neophasia*.  
 napi—*Pontia*.  
 nausturtii—*Pontia napi*.  
 occidentalis—*Pontia*.  
 oleracea—*Pontia napi*.  
 pallida—*napi*.  
 protodice—*Pontia*.  
 rapæ—*Pontia*.  
 sara—*Synchlœ*.  
 sisymbri—*Pontia*.  
 venosa—*Pontia napi*.  
 yreka—*Pontia rapæ*.

*Pontia* 1758 rapæ. napi: no definite black patch at tip of front wings. 1833



protodice: veins of hind wings broadly bordered with black. 1854 *sisymbri*: veins black above. 1866 *occidentalis*: veins of hind wings narrowly bordered with black. 1871 *beckeri*: somewhat mottled beneath with green.

<i>Pontia beckeri</i> (Edw.)	<i>creusa</i> (D. & H.)
<i>napi</i> (Linn.)	flora—sara.
<i>occidentalis</i> (Reak.)	<i>lanceolata</i> (Boisd.)
protodice (B. & L.)	<i>lotta</i> Beut.
<i>rapæ</i> (Linn.)	sara Boisd.
<i>sisymbri</i> (Boisd.)	<i>Terias midea</i> (undetermined).
<i>Rhodocera rhamni</i> — <i>Zerene eurydice</i> .	<i>mexicana</i> (eastern).
<i>Synchlœ ausonides</i> (Boisd.)	<i>nicippe</i> — <i>Eurema</i> .
<i>australis</i> Gr.	<i>Xanthidia mexicana</i> (not California).
<i>caliente</i> (Wr.)	<i>Zerene cæsonia</i> Stoll.
<i>cethura</i> Feld.	<i>eurydice</i> Boisd.

#### NYMPHALIDÆ.

This family shows the most diversity of form among butterflies. The food habits of the larvæ are as follows:— Oaks *Adelpha* and *Basilarchia* lorquini. Elm *Euvanessa*. Poplar *Euvanessa* and *Basilarchia* archippus. Willow *Euvanessa*, *Basilarchia* archippus and *Polygonia faunus*. *Ceanothus* *Eugonia*. Thistle *Phyciodes mylitta*. Nettle *Aglais*, *Polygonia satyrus* *Vanessa atlanta* and *cardui*. *Azalea* *Polygonia silvius* and *zephyrus*. Passion flower *Agraulis* and *Euptoieta*. Violets *Argynnis*, *Brenthus* and *Euptoieta*. *Scrophulariaceæ* *Lemonias*. Hops and *Boehmeria* *Vanessa atlanta*. *Gnaphalium* and *Antennaria* *Vanessa huntera*. *Cnicus*, *Carduus* and *Althæa* *Vanessa cardui*. *Lavatera assurgentiflora* and *Malva* *Vanessa caryæ*. *Plantago*, *Gerardia* and *Antirrhinum* *Junonia*.

A migration of very great numbers of *Eugonia* occurred in 1912 in the northern part of the state, and a few years before in southern California *Vanessa cardui* flew in equally great numbers.

#### SYNOPSIS OF GENERA.

*Argynnis*: wings mottled with brown or black including a row of round black dots in the center of a broad submarginal band across both wings. *Brenthus*: these spots also beneath. *Euptoieta*: median band paler than submarginal.

*Lemonias*: under side of hind wings much paler than front wings. *Phyciodes*: second joint of palpi enlarged. *Thesalia*: more than half of the hind wing beneath yellow.

*Polygonia*: outer edge of wings angular. *Junonia*: wings with large eyespots above. *Euvanessa*: wings black with pale border. *Aglais*: reddish band across wings just within black border. *Vanessa*: hind wings spotted beneath. *Eugonia*: no silver spots beneath on hind wing.

*Basilarchia*. *Agraulis*: front wings more than twice as long as broad. *Limnitis*: eyes hairy.

*Adelpha bredowii*—*Limnites bredowii*. *Apatura drummondi* Kirby.

*californica*—*Limnites bredowii*. *Argynnis adiante*—*adiaset*.

*Aglais milberti* (Goda.)                   *adiaste* Behr.

*Agraulis vanillæ* (Linn.)               *adraste*—*adiaste*.

aglaia—edwardsii.  
 arge—eurynome.  
 atossa Edw.  
 behrensii Edw.  
 bellona (eastern).  
 bremeri Edw.  
 callippe Boisd.  
 chitone Edw.  
 coronis Behr.  
 cybele—leto.  
 edwardsii Reak.  
 egleis Boisd.  
 egleis—montivaga.  
 epithore—Brenthis.  
 eurynome Edw.  
 hegesia—Euptoieta.  
 hippolyta Edw.  
 hydaspe—Zerene.  
 inornata Edw.  
 irene—ruprestris.

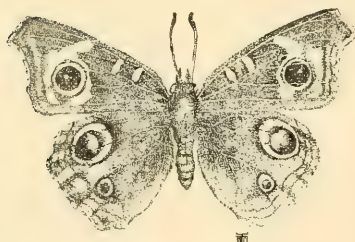


Figure 18. *Junonia cœnia*.

juba—coronia.  
 laura Edw.  
 liliana Edw.  
 macaria—eurynome.  
 monticola Behr.  
 montivaga Behr.  
 montivaga—egleis.  
 montevaga—irene.  
 mormoria—egleis.  
 nenoquis—egleis.  
 nevadensis Edw.  
 nokomis Edw.  
 oweni—hippolyta.  
 purpurascens—monticola.  
 ruprestris Behr.  
 semiramus Edw.  
 zerene Boisd.  
**Basilarchia archippus Cram.**  
 arthemis (not California).  
 astynax (not California).

dissippus—archippus.  
 lorquini (Boisd.)  
 weidemeyer (not California).  
**Brenthis bellona (eastern).**  
 epithora (Boisd.)  
 morrisoni (not California).  
 myrina (eastern).  
 nenoquis (not California).  
**Charidryas carloa (not California.)**  
 nycteis (not California).  
**Chlorippe antoria (not California.)**  
 celtis (not California).  
 leila (not California).  
 Dione vanillæ—Agraulis.  
**Eugonia californica (Boisd.)**  
 Eresia hermas (undet rmined).  
 punctata (not California).  
**Euptoieta claudia (Cram.)**  
**Eu Vanessa antiopa (Linn.)**  
 Grapta c-album—**Polygonia oreas.**  
 hegesia Cram.  
 faunus—Polygonia.  
 marysas—polygonia.  
 oreas—Polygonia.  
 rusticus—Polygonia faunus.  
 satyrus—Polygonia.  
 silens—Polygonia oreas.  
 silvius—Polygonia.  
 zephyrus—Polygonia.  
**Junonia cœnia Hueb.**  
 genovera—cœnia.  
 lavinia—cœnia.  
 orythia—cœnia.  
**Heterochroa bredowii—Limenitis.**  
 californica—**Limenitis bredowii.**  
 eulalia—**Limenitis bredowii.**  
**Kodiosoma lorquini—Basilarchia.**  
**Lemonias anicia D. & H.)**  
 augusta (Edw.)  
 baroni (Edw.)  
 chalcedon (D. & H.)  
 cooperi (Behr.)  
 edetha (Boisd.)  
 gabii (Behr.)  
 hoffmani (Behr.)  
 macglashani (Riv.)  
 nubigena (Behr.)  
 palla (Boisd.)  
 quino (Behr.)  
 rubicunda (Edw.)  
 whitneyi (Behr.)  
**Limnitis bredowii (Hubn.)**  
 eulala—bredowii.  
 lorquini—**Basilarchia.**  
**Melitæa anicia—Lemonias.**

- augusta—*Lemonias*.  
 baroni—*Lemonias*.  
 campestris—*Phyciodes pratensis*.  
 canace—*Phyciodes picta*.  
 chalcedon—*Lemonias*.  
 callina—*Phyciodes mylitta*.  
 collina—*Phycioides mylitta*.  
 cooperi—*Lemonias*.  
 dwinnelli—*Lemonias chalcedon*.  
 editha—*Lemonias*.  
 epula—*Phycioides mylitta*.  
 gabii—*Lemonias*.  
 gloriosa (undetermined).  
 helcita—*Lemonias hoffmani*.  
 hermes (undetermined).  
 hoffmani—*Lemonias*.  
 leanira—*Thesalia*.  
 macglashani—*Lemonias*.  
 montana—*Phycioides*.  
 mylitta—*Phycioides*.  
 nubigena—*Lemonias*.  
 oblitterata—*Thesalia leanira*.  
 obsoleta—*Thesalia leanira*.  
 orseis—*Phycioides pratensis*.  
 palla—*Lemonias*.  
 pratensis—*Phycioides*.  
 pola—*Phycioides whitneyi*.  
 pulchella—*Phycioides mylitta*.  
 pulchella—*Phycioides pratensis*.  
 quino—*Lemonias*.  
 rubicunda—*Lemonias*.  
 sonoræ—*Lemonias gabbi*.  
 thecla—*Thesalia*.  
 theona—*Thesalia*.  
 whitneyi—*Lemonias*.  
 wrightii—*Thesalia*.  
*Vanessa*. 1758 *cardui*. atlanta: red band across front wings. 1775 *huntera*: two large eyespots beneath hind wings. 1806 *carye*: black band across cell of front wings.  
*Vanessa antiopa*—*Eu Vanessa*.  
 atlanta (Linn.)  
 californica—*Eugonia*.  
 cardui (Linn.)  
 carye Hueb.  
 huntera (Fabr.)  
 marsyas—*Polygonia satyrus*.  
 zerena—*Argynnis*.  
*Nymphalis lorquini*—*Basilarchia*.  
*Papilio antiopa*—*Eu Vanessa*.  
 atlanta—*Vanessa*.  
 cardui—*Vanessa*.  
 claudia—*Euptoieta*.  
 hegesia—*Euptoieta*.  
 huntera—*Vanessa*.  
 vanillæ—*Agraulis*.  
*Phycioides canace*—*picta*.  
 hermas (not California).  
 montana (Behr.)  
 mylitta (Edw.)  
 orseis—*pratensis*.  
 picta (Edw.)  
 pratensis (Behr.)  
 tharos (not California).  
*Polygonia faunus* (Edw.)  
 interrigitonnis (not California).  
 oreas (Edw.)  
 rusticus—*faunus*.  
 satyrus (Edw.)  
 silenus—*oreas*.  
 silvius (Edw.)  
 zephyrus (Edw.)  
*Pyrameis atlanta*—*Vanessa*.  
 cardui—*Vanessa*.  
 carye—*Vanessa*.  
 elymi—*Vanessa cardui*.  
 huntera—*Vanessa*.  
*Rhodocera lorquini*—*Basilarchia*  
*Thesalia leanira* (Boisd.)  
 thekla (Edw.)  
 theona (Men.)  
 wrightii (Edw.)  
 milberti—*Aglais*.  
 oreas—*Polygonia*.  
 rusticus—*Polygonia faunus*.  
 satyrus—*Polygonia*.  
 silvius—*Polygonia*.  
 zephyrus—*Polygonia*.

## AGAPETIDÆ.

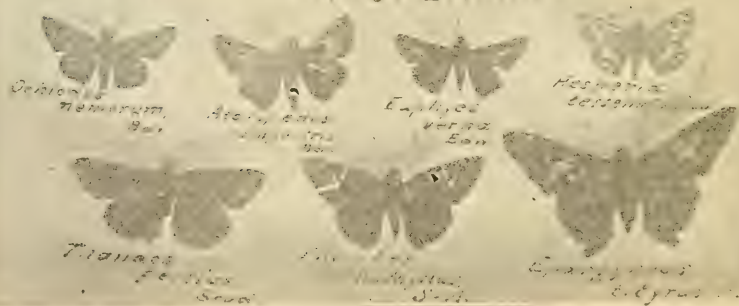
These butterflies have been called nymphs or satyrs and our commonest genus *Cænonympha*, ringlets. All of the species as far as known feed as larvæ on grasses and sedges and when just hatched have very large heads.

- atlantus (Gr.)  
 baroni (not California).  
 paulus (Edw.)  
 meadii (not California).  
 ætus (Boisd.)  
*Cercyonis alope* (Fabr.)

## PAPILIONIDÆ.



## HESPERIDÆ.





- stephani—*Cercyonis*.  
 sthenele (Boisd.)  
 sylvestris (Edw.)  
 stephani (Wr.)  
 wheeleri (Edw.)  
*Chionobas californicus*—*Cæneis nevadensis*.  
 chryxus—*Cæneis*.  
 galactinus—*Cænonympha californica*.  
 iduna—*Cæneis nevadensis*.  
 ivallda—*Cæneis chryxus nevadensis*—*Cæneis*.  
*Cænonympha brenda*—*ochracea californica* D. & H.  
 eryngii—*californica*.  
 galactina—*californica*.  
 inornata (not California).  
 ochracea Edw.  
 panphilioides—*pamphilus*.  
 pamphilus (Linn.)  
 pulla—*californica*.  
*Hipparchia boopis*—*Cercyonis alope*.  
 sylvestris—*Cercyonis ætus*.  
*Libythea bachmanii* (not California).
- carineta (not California).  
 Neominois ridingsi (not California).  
 Neonympha henshawi (not California).  
 rubrica (not California).  
*Cæneis californica*—*nevadensis*.  
 chryxus (D. & H.)  
 iduna—*nevadensis*.  
 ivallda—*chryxus nevadensis* (Feld.)  
 macounii (eastern).  
 Papilio alope—*Cercyonis*.  
 pamphilus—*Cænonympha*.  
 Satyrus alope—*Cercyonis alope*.  
 adriane—*Cercyonis alope*.  
 atlantus—*Cercyonis*.  
 baroni—*Cercyonis alope*.  
 boopis *Cercyone alope*.  
 californica—*Cænonympha*.  
 charon—*Cercyonis alope*.  
 nephele—*Cercyonis alope*.  
 ætus—*Cercyonis alope*.  
 paulis—*Cercyone*.  
 silvestris—*Cercyonis*.  
 sthenele—*Cercyonis*.  
 wheeleri—*Cercyonis*.

## ITHOMIIDÆ.

These are southern forms only rarely reaching California. The food habits of very few are accurately known.

- Ceratinia lycaste*—*Dynothea*.  
*Dynothea lycaste* (Fabr.)  
*Ithomia lycaste*—*Dynothea*.
- Mechanitis californica* Reak.  
*Papilio lycaste*—*Dynothea*.  
*Papilio lycaste*—*Dynothea*.

## LYMNADIDÆ.

The common well known milkweed butterfly sometimes called the monarch. Sometimes these butterflies assemble in dense swarms which when alighting on a tree almost hide the color of the leaves.

- Anosia plexippus* (Linn.)  
*Danaus archippus*—*Anosia plexippus*.

## RIODINIDÆ.

A small family closely allied to the *Lycænidæ*. Food habits unknown.

- Apodemia mormo*—*Chrysobia*.  
*Calephelis australis*—(Edw.)  
 nemesis Edw.  
*Charis australis*—*Calephelis*.  
*Chrysobia mormo* (Feld.)
- Lemonias australis—*Calephelis*.  
 mormo—*Chrysobia*.  
 virgulti—*Chrysobia*.  
 Nemeobius virgulti—*Chrysobia*.

## LYCÆNIDÆ.

The dainty little blue and copper colored butterflies constitute this family.

A number of species feed on oak; others are rather general feeders. The habits of very few are accurately known.

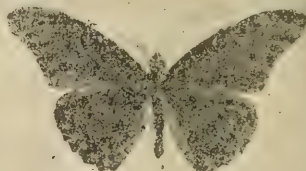
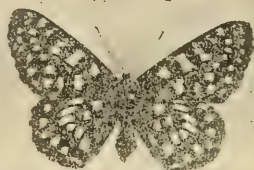
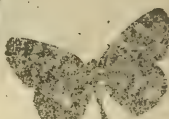
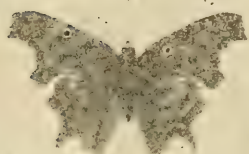
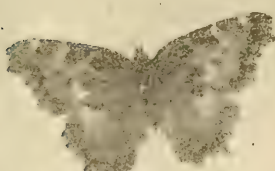
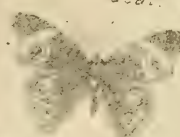
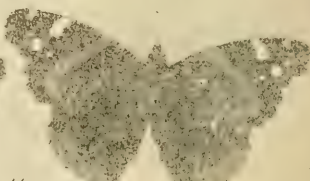
- Agriades podarce** (Feld.)  
**Atlides halesus** (Cram.)  
**Brephidium exilis** (Boisd.)  
**Callophrys apama** (not California).  
     **dumetorum** (Boisd.)  
**Callipsyche behrii** (Edw.)  
**Chalceria cupreus** (Edw.)  
**Chrysophanes americana** (eastern)  
     **arota**—**Tharsalia**.  
     **cupreus**—**Chalceria**.  
     **editha**—**Gædes**.  
     **fasciata** (eastern).  
     **gorgon**—**Gædes**.  
     **heloïdes**—**Epidemia**.  
     **hermes**—**Tharsalia**.  
     **hypophleas** (eastern).  
     **mariposa**—**Epidemia**.  
     **virginiensis**—**Tharsalia**.  
     **xanthoides**—**Gædes**.  
     **zeræ**—**Epidemia**.  
**Cupido ardea** (Edw.)  
     **clara** (Edw.)  
     **dædalus**—**icarioides**.  
     **fulla** (Edw.)  
     **heteronea** (Boisd.)  
     **hilda** Gr.  
     **icarioides** (Boisd.)  
     **pheres** (Boisd.)  
     **sæpiolus** (Boisd.)  
**Cyaniris ladon** Cram.  
     **pseudargoilus**—**ladon**.  
**Epidemia helloïdes** (Boisd.)  
**Everes amyntula** (Boisd.)  
     **monica** (Reak.)  
     **tejuæ** (undetermined).  
**Gædes editha** (Barnes).  
     **gorgon** (Boisd.)  
     **xanthoides** (Boisd.)  
**Habrodias grunus** (Boisd.)  
**Helodes hypophlæus** (not California.)  
**Hemiargus isola** (not California).  
**Hypauratus crysalus** (Edw.)  
**Incisalia angusta** (eastern).  
     **eryphon** (Boisd.)  
     **iroides** (Boisd.)  
**Leptotes mariana** (Reak.)  
     **striata** (Edw.)  
**Lycæna acmon**—**Rusticus**.  
     **amyntula**—**Everes**.  
     **anna**—**Rusticus**.  
     **antiacis**—**Nomiades**.  
     **arota**—**Tharsalia**.  
     **argyrotoxis**—**Rusticus anna**.  
     **battoides**—**Rusticus**.  
     **behrii**—**Nomiades antiacis**.  
     **cajona**—**Rusticus anna**.  
     **catalina**—**Phædrotus sagittigera**.  
     **eilla**—**Agriades**.  
     **clara**—**Cupido**.  
     **cupreus**—**Chalceria**.  
     **dædalus**—**Cupido iraroides**.  
     **echo**—**Cyaniris ladon**.  
     **enoptes**—**Rusticus**.  
     **erymus**—**Cupido icaroides**.  
     **evius**—**Cupido pheres**.  
     **exilis**—**Brephidium**.  
     **fuliginosa**—**Satyrium**.  
     **fulla**—**Cupido**.  
     **helios**—**Cupido phileros**.  
     **heloïdes**—**Epidemia**.  
     **hermes**—**Tharsalia**.  
     **heteronea**—**Cupido**.  
     **icaroides**—**Cupido**.  
     **lotis**—**Rusticus**.  
     **lupini**—**Rusticus shasta**.  
     **lygdamus**—**Nomiades**.  
     **maricopa**—**Icaroides**.  
     **mariposa**—**Epidemia**.  
     **marina**—**Leptotes**.  
     **meritula**—**Nomiades antiacis**.  
     **mintha**—**Cupido icaroides**.  
     **monica**—**Everes**.  
     **orbitulus** (not California).  
     **oreus**—**Nomiades lygdamus**.  
     **pardalis**—**Cupido icaroides**.  
     **pheres**—**Cupido**.  
     **philemon**—**Rusticus anna**.  
     **phileros**—**Cupido**.  
     **piasus**—**Cyaniris ladon**.  
     **podarce**—**Agriades**.  
     **polyphemus**—**Nomiades antiacis**.  
     **pseudargoilus**—**Cyaniris ladon**.  
     **regia**—**Philotes sonoriensis**.  
     **rhæa**—**Phædrotus sagittigera**.  
     **rustica** (not California)  
     **sæpiolus**—**Cupido**.  
     **sagittigera**—**Phædrotus**.  
     **scudderi** (eastern).  
     **shasta**—**Rusticus**.  
     **sonorensis**—**Philotes**.  
     **speciosa**—**Phædrotus**.  
     **striata**—**Leptotes**.  
     **tehama**—**Agriades podarce**.  
**Satyrium fuliginosa** (Edw.)

- ardea—Cupido.  
 Thanaos pernigra Gr.  
 Strymon melinus—Oranotes.  
 Tharsalia arota (Boisd.)  
   hermes (Edw.)  
   virginiensis (Edw.)  
 Thecla academica—californica.  
   acid (eastern).  
   adenostomatis Edw.  
   angustus (eastern).  
   auretorum Boisd.  
   behrii—Callipsyche.  
   blendina (not California)  
   californica Edw.  
   chalcis Behr.  
   crysalus—Hypaurotus.  
   cygnus—californicus.  
   dryope Edw.  
   dumetorum—Callophrys.  
   exolita—nelsonii.  
   euryphor—Incisalia.  
   fuliginose—Satirium.  
   fulvescens—sæpium.  
   grunus—Habrodias.  
   halesus—Atlides.  
   ilavia Beut.  
   iroides—Incisalia.  
   loki Sk.  
   melinus—Uranotes.  
   mirabile—ilavia.  
   muri—nelsonii.  
   nelsonii Boisd.  
   pudica—Uranotes melinus.  
   sæpium Boisd.  
   spadix Edw.  
   spinetorum Boisd.  
   sylvius Boisd.  
   tacita Edw.  
   tetra Behr.  
 Uranotes alcestis (not California.)  
   melinus (Hueb.)
- tejuna (undetermined).  
 viaca—Phædrotes sagittigera.  
 xanthoides—Gæides.  
 xerxes—Nomiades.  
 virginiensis—Tharsalia.  
 Metura acis (eastern).  
 Nomiades antiacis (Boisd.)  
   lygdamus (Doub.)  
   xerxes (Boisd.)  
 Papilio halesinus—Atlides.  
 Phædrotes sagittigera (Feld.)  
   speciosa (Edw.)  
 Philotes sonorensis (Feld.)  
   speciosa—Phædrotes.  
 Polymmatous amyntula—Everes.  
   antægon—Rusticus acmon.  
   antiacis—Nomiades.  
   arota—Tharsalia.  
   enoptes—Rusticus.  
   exilis—Brepidium.  
   gorgon—Gæides.  
   heloides—Epidemia.  
   heteronea—Cupido.  
   hypophleas (eastern).  
   icaroides—Incisalia.  
   nivalis—Epidemia mariposa.  
   pheres—Cupido.  
   piasus—Cyaniris ladon.  
   sæpialus—Cupido.  
   xanthoides—Gæides.  
   xerxes—Nomiades.  
 Rusticus acmon (D. & H.)  
   anna (Edw.)  
   battoides (Behr.)  
   chlorina Skin.  
   enoptes (Boisd.)  
   lotis (Lintn.)  
   neurona Skin.  
   scudderii (eastern).  
   shasta (Edw.)

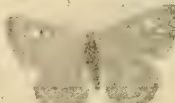
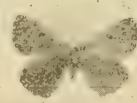
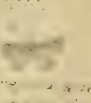
# HESPERIDÆ.

- The small heavy bodied butterflies form this family. They are considered the nearest allied to the moths. Epargyreus feeds on Wistaria, Eudamus pylades on clover and other plants and Pholisora catulla on lambsquarter. Achalarus cellus (not California).  
 Amblyscirtes ænus Edw.  
   simius Edw.  
 Anatolmis regularis Gr.  
 Ancholyxpha arene (Edw.)  
   numitor (not California).
- Anthomaster agricola (Boisd.)  
   nemorum (Boisd.)  
   pratincola (Boisd.)  
   sylvanoides (Boisd.)  
   verus (Edw.)  
 Atalopedes campestris (Boisd.)

## NYMPHALIDÆ

*Anosia plexippus*, L.*Agraulis vanillae*, L.*Argynnis notornis*, Edw.*Melitæa chalcodon*, Dyli*Phycodes proterops*, Dyli*Polygonia satyrus*, Edw.*Argynnis malthæa*, Edw.*Eurymnestra antiopa*, L.*Euphydryas edithæ*, Dyli*Junonia ceia*, H.*Junonia atlanta*, L.*Adelphe californica*, Dyli

## LYCENIDÆ

*Ceanothus californica*, Dyli*hypalus packmanii*, Dyli*Chrysobothris argentea*, Dyli*Urantes melinus*, Dyli*Gossides xanthoides*, Dyli*Melades hypophæus*, Dyli*Reticularia anita*, Dyli*Reticularia anita*, Dyli



- Prenes errans* Skin.  
*Pyrgus cæspitalis*—*Hesperia*.  
     *ericetorum*.—*Hesperia*.  
     *petreius*—*Hesperia cæspitalis*.  
     *ricara*—*Hesperia cæspitalis*.  
     *syrichtus*—*Hesperia*.  
     *manden*—*Pamphilia palæmon*.  
     *omaha*—*Potanthus dara*.  
*Cocceius pylades*—*Eudamus*.  
*Copæodes arene*—*Ancyloxypha*.  
     *eunus* Edw.  
     *procris* Edw.  
     *wrightii* Edw.  
*Epargyreus exadeus*—*Eudamus*.  
     *tityrus* (Fabr.)  
*Erynnis cabelus* Edw.  
     *columbia*—*comma*.  
     *comma* (Linn.)  
     *juba*—*comma*.  
     *manitoba* *comma*.  
     *oregona*—*comma*.  
     *ruricola*—*Atrytona*.  
     *taxilis*—*Atrytona*.  
*Eudamus æmilea* Skin.  
     *albofasciatus* (not California).  
     *exadeus* Cram.  
     *mexicana* H. S.  
     *nevada*—*mexicana*.  
     *pylades* Scud.  
     *symplicius* (not California).  
     *tityrus*—*Epargyreus*.  
*Euphyes verna* (not California).  
     *vestris* (Boisd.)  
*Herperia agricola*—*Anthomaster*.  
     *cæspitalis* (Boisd.)  
     *campestris*—*Hylephila*.  
     *comma*—*Erynnis*.  
     *ericetorum* (Boisd.)  
     *melane*—*Phycanassa*.  
     *nemorum*—*Anthomaster*.  
     *pratincola*—*Anthomaster*.  
     *sabuleti*—*Polites*.  
     *ruricola*—*Atrytone*.  
     *scriptura* (Boisd.)  
     *sylvanoides*—*Anthomaster*.  
     *sylvanus* (European).  
     *syrichtus* (Fabr.)  
     *tessellata* Scud.  
     *vestris*—*Euphyes*.  
*Hylephila campestris*—*Atalopedes*.  
     *morrisonii*—*Atalopedes*.  
     *phylæus* (Drury.)  
*Larema deva* Edw.  
*Leroda comus* (not California).  
*Limochroës cerna*—*manataaquæ*.  
     *manataaquæ* (Scud.)  
     *morrisonii* (Edw.)  
*Atrytone melane*—*Phycanassa*.  
     *taxiles* Edw.  
*Calpodes rhena* Edw.  
*Carterocephalus arane*—*Anchyloxypha*.  
     *californicus*—*Potanthus dara*.  
     *tristis*—*Thanaos*.  
*Ochlodes agricola*—*Anthomaster*.  
     *nemorum*—*Anthomaster*.  
     *pratincola*—*Anthomaster*.  
     *sylvanoides*—*Anthomaster*.  
     *verus*—*Anthomaster*.  
*Pamphilia agricola*—*Anthomaster*.  
     *aragos* (not California).  
     *cabeus*—*Erynnis*.  
     *californicus* Wr.  
     *campestris*—*Anthomaster*.  
     *chiapa* Wr.  
     *colorado*—*Erynnis comma*.  
     *columbia*—*Erynnis comma*.  
     *comma*—*Erynnis*.  
     *errans*—*Prenes*.  
     *huron*—*Atalopedes campestris*.  
     *idaho*—*Erynnis comma*.  
     *juba*—*Erynnis comma*.  
     *manataaquæ*—*Limochroës*.  
     *mandan* (not California).  
     *manitoba*—*Erynnis comma*.  
     *melane*—*Phycanassa*.  
     *nemorum*—*Anthomaster*.  
     *omaha* (not California).  
     *oregona*—*Erynnis comma*.  
     *osceola*—*vestris*.  
     *palæmon* Pall.  
     *pratincola*—*Anthomaster*.  
     *phylæus*—*Hylephila*.  
     *ruricola*—*Atrytone*.  
     *sabuleti*—*Polites*.  
     *sylvanoides*—*Anthomaster*.  
     *sylvanoides*—*Erynnis comma*.  
     *sylvanus* (European).  
     *taxilis*—*Atrytone*.  
     *verus*—*Anthomaster*.  
     *vestris*—*Euphyes*.  
     *yreka*—*Anthomaster nemorum*.  
*Papilio comma*—*Erynnis*.  
     *phylæus*—*Hylephila*.  
     *syrichtus*—*Hesperia*.  
*Phorisoræ alpheus* Edw.  
     *catullus* (Fabr.)  
     *libya* Scud.  
*Phycanassa melane* (Edw.)  
*Polites sabuleti* (Boisd.)  
*Potanthus dara* (Kol.)  
     *californica*—*dara*.

- phylace (Edw.)  
 Nisioniades cervantes (European.)  
   funeralis—**Thanaos**.  
   propertius—**Thanaos**.  
   tages (European).  
   tessellata—**Hesperia**.  
   cæspitalis—**Hesperia**.  
 Syrichtus cæspitalis—**Hesperia**.  
   ericetorum—**Hesperia**.  
   ruralis (not California).  
   scriptura—**Hesperia**.  
   tessellatus—**Hesperia**.  
 Thanacs brizo B. & .  
   cervantes (European).  
   funeralis S. & A.  
   icelus (not California).  
   lilius **Dyer**.  
   juvenalis (not California.)  
   persius (Scud.)  
   propertius (Linn.)  
   tages (European).  
   tribullus S. & B.  
   tristis **Boisd.**  
 Thorybes æmilea—**Eudamus**.  
   bathyllus (eastern).  
   mexicana—**Eudamus**.  
   nevada—**Eudamus mexicana**.  
   pylades—**Eudamus**.  
 Thymelious brettus (B. & L.)  
   erynnioides **Dyar**.

### SPHINGINA — Hawkmoths.

Monograph:— Rothschild, Revision of the Lepidopterous Family Sphingidæ.

#### SPHINGIDÆ.



Figure 22. *Pachysphinx modesta*

The sphinx moths include two important pests; the tobacco or tomato worm *Protoparce* and *Pholus* that attacks the grape and *Ampelopsis*. Other species of little economic importance are: *Sphinx* on willow, *Pachysphinx* on willow and poplar, *Hyloicus* on wild cherry, ash and privet, and *Celario* on *portulaca* and other weeds.

#### SYNOPSIS OF GENERA.

**Hyloicus**: markings on front wings longitudinal. **Celario**: veins white. **Errinyis**: no pale band across hind wings.

**Protoparce**: front wings with cross bands. **Sphinx**: eye spots on hind wings.

**Arctonotus:** bands in pairs. **Pachysphinx:** basal third of front wings pale. **Euproserpinus** and **Proserpinus:** with broad border on hind wings, the latter with base of hind wings red.

**Hæmorrhagia:** wings in part transparent.

- Anceryx ello—**Erinnus**.  
 Arctonotus lucidus Boisd.  
 Celerio intermedia (Kirby.)  
     lineata (Fabr.)  
 Chærocampa procne (undetermined).  
 Cryptopogon ophthalmicus—**Sphinx**  
     cerasyi.  
 Deilephila daucus—**Celario** lineata.  
     grafil—**Celario** intermedia.  
     intermedia—**Celerio**.  
     lineata—**Celario**.  
 Dilophonota ello—**Erinnus**.  
 Erinnus ello (Linn.)  
 Euproserpinus euterpe (Edw.)  
     phæton (G. & R.)  
 Hæmorrhagia senta (Stretch).  
     thetis (Boisd.)  
 Hemeris cyanoglossum—**Hæmorrhagia**  
     thetis.  
     diffinis—**Hæmorrhagia** senta.  
     diffiniis—**Hæmorrhagia** thetis.  
     papalis—**Hæmorrhagia** thetis.  
     rubens—**Hæmorrhagia** senta.  
     thetis—**Hæmorrhagia**.  
     thetis—**Hæmorrhagia** senta.  
 Hyloicus chersis (Hueb.)  
     drupiferarum (S. & A.)  
     lugens (Walk.)  
     perelegans (Edw.)  
     sequoiæ (Boisd.)  
     vancouverensis (Edw.)  
 Lepisesia clarkia—**Proserpinus**.  
     phæton—**Euproserpinus**.  
 Lethia chersis—**Hyloicus**.  
 Lintneria perelegans—**Hyloicus**.  
 Macroglossa erata—**Euproserpinus**  
     phæton.  
     phæton—**Euproserpinus**.  
     senta—**Hæmorrhagia**.  
     thetis—**Hæmorrhagia**.  
 Pachysphinx modesta (Harr.)  
 Philampelus achemon—**Pholus**.  
 Pholus achemon (Drury).  
 Proserpinus clarkia (Boisd.)  
 Protoparce quinquemaculata Haw.  
     sexta Johan.  
 Pteropogon clarkia—**Proserpinus**.  
 Sesia thetis—**Hæmorrhagia**.  
 Smerintus imperator—**Pachysphinx**  
     modesta.  
     modesta—**Pachysphinx**.  
     ophthalmicus—**Hyloicus** vancouverensis.  
     pallidulus—**Hyloicus** vancouverensis  
     modesta.  
 Sphinx achemon—**Pholus**.  
     carolina—**Hyloicus**.  
     cerisyi Kirby.  
     chersis—**Hyloicus**.  
     drupiferarum—**Hyloicus**.  
     ello—**Erinnus**.  
     lineolata—**Hyloicus**.  
     lugens—**Hyloicus**.  
     modesta—**Pachysphinx**.  
     oreodaphne—**Hyloicus** chersis.  
     perelegans—**Hyloicus**.  
     quinquemaculata—**Protoparce**.  
     sequoiæ—**Hyloicus**.  
     strobi (not California).  
     vancouverensis—**Hyloicus**.  
 Triptopogon imperator—**Pachysphinx**  
     modesta.  
     modesta—**Pachysphinx**.  
     occidentalis—**Pachysphinx** modesta.

## SATURNINA.

### SATURNIIDÆ.

The Saturniidæ include the largest moths. None are very injurious tho Telea feeds on many plants including fruit trees. Samia feeds on Ceanothus.

### SYNOPSIS OF GENERA.

**Hemileuca.** Saturnia: hind wings black. **Telea:** a small transparent spot

on each wing. *Samia*: eye spot at tip of front wing. *Saturnia*: eye spot on middle of wing.

*Attacus ceanothi*—*Samia rubra*.  
*polyphemus*—*Telia*.

*Calosaturia mendocino*—*Saturnia*.  
*Dryocampa riversii* (undetermined).

*Hemileuca artemis*—*nevadensis*.

*californica*—*nevadensis*.

*electa* Wr.

*lucina*—*nevadensis*.

*nevadensis* Str.

*neumoegenii* Edw.

*Platysamia californica*—*Samia rubra*.

*Pseudohazis denudata*—*eleganterina*.

*eleganterina* (Boisd.)

*shastensis*—*eleganterina*.

*Samia californica*—*rubra*.

*ceanothi*—*rubra*.

*euryalis*—*rubra*.

*rubra* Behr.

*Saturnia californica*—*Samia rubra*.

*ceanothi*—*Samia rubra*.

*eleganterina*—*Pseudohazis*.

*denudata*—*Pseudohazis eleganterina*.

*mendocino* Behrens.

*Telea ceanothi*—*Samia rubra*.

*eleganterina*—*Pseudohazis*.

*polyphemus* (Cram.)

## BOMBYCINA.

### SYNTOMIDÆ.

Day flying moths with wings shaped somewhat like those of a wasp.

#### SYNOPSIS OF GENERA.

*Ctenucha*. *Lycomorpha*:: front wings red. *Scepsis*: small, spread of wings about 30 m.m.

*Apitosis multifaria*—*Ctenucha*.

*Ctenucha brunnea* (Stretch.)

*corvina*—*rubroscapus*.

*harrisii* (undetermined).

*luteoscapsis*—*multifaria*.

*multifaria* Walk.

*orthoscapsis*—*rubroscapus*.

*robinsonii* (undetermined).

*rubroscapus* (Men.)

*Glaucopsis rubroscapus*—*Ctenucha*.

*Lycomorpha fulgens* Edw.

*fulvicollis* (eastern).

*Scepsis gravis*—*wrightii*.

*packardi* Grote.

*wrightii* Stretch.

### LITHOSIIDÆ.

The moths of this family feed on lichens.

*Cisthene faustinula*—*Illice*.

*lactea*—*Clemensia*.

*nexa*—*Illice*.

*Clemensia albata* Pack

*lactea* Stretch.

*Illice faustinula* Boisd.

*nexa* Boisd.

### ARCTIIDÆ.

Monograph:—Hampson, Catalogue of the Lepidoptera Phalænæ of the British museum. Vol. III.

*Æmilia roseata* (Walk.)

*Ammalo tenera* (Hueb.)

*Antarctia proba*—*Diacrisia vagans*.

*punctata*—*Diacrisia vagans*.

*nevadensis*—*Apantesis*.

*ornata*—*Apantesis*.

*shastensis*—*Apantesis nevadensis*

*simplicior*—*Apantesis ornata*.

*rubra* *Diacrisia*.

*Apantesis arge* (Drury.)

*blakei* (Grote).

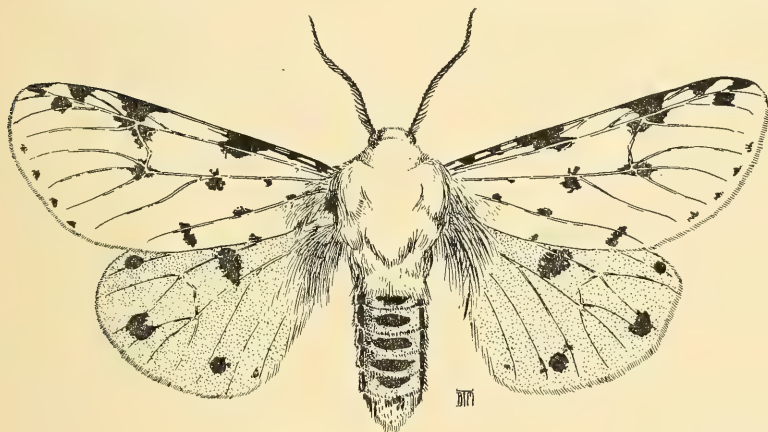
*nevadensis* (G. & R.).

*ornata* (Pack.).

*proxima* (Guer.).



- Arachnis aulæa* (not California).  
*picta* (Pack.).  
*Arctia achaia*—*Apantesis ornata*.  
*arge*—*Apantesis*.  
*blakei*—*Apantesis*.  
*bolanderi*—*Apantesis blakei*.  
*caia* (Linn.).  
*dahurica*—*Apantesis ornata*.  
*docta*—*Apantesis proxima*.  
*doris*—*Apantesis arge*.  
*edwardsii*—*Apantesis ornata*.  
*fuliginosa*—*Phragmatobia*.  
*geneura*—*Apantesis nevadensis*.  
*nerea*—*Apantesis*.  
*vagans*—*Diacrisia*.  
*Cynia tenera*—*Ammalo*.  
*Diacrisia rubra* (Neum.)  
*vagans* (Boisd.).  
*virgincia* (Fabr.).  
*Ecpantheria deflorata* (Fabr.)  
*incarnata*—*Lerina*.  
*permaculata*—*Turuptiana*.  
*scribonia*—*deflorata*.  
*Epicallia guttata*—*Platyrepia virgin-*  
*alis*.  
*virginalis*—*Platyrepia*.  
*Euchaetes elegans*—*Pygarcia*.  
*sciurus*—*Ammalo tenera*.  
*scudderi*—*Parasemia plantaginis*.  
*yosemite*—*Ammalo tenera*.

Figure 23. *Eustigmene acreæ*.

- virginalis*—*Platyrepia*.  
*Bombyx acreæ*—*Eustigmene*.  
*caia*—*Arcita*.  
*deflorata*—*Ecpantheria*.  
*plantaginis*—*Parasemia*.  
*virginica*—*Diacrisia*.  
*Callaretia ornata*—*Apantesis*.  
*Callimorpha lecontei*—*Haploa*.  
*Chelonia achaia*—*Apantesis ornata*.  
*proxima*—*Apantesis*.  
*sciurus*—*Isia isabella*.  
*virginalis*—*Platyrepia*.  
*Cordiosoma fulvum*—*Kodiosoma*.  
*nigrum*—*Kodiosoma fulva*.  
*Ctenucha harrissi*—*Pygoctenucha ter-*  
*minalis*.  
*robinsonii*—*Lerina incarnata*.  
*Euprepia blakei*—*Apantesis*.  
*caia*—*Arctia*.  
*Euschausia argentata* (Pack.)  
*Eustigmene acreæ* (Drury).  
*albida* (Strech).  
*Eutrepia acajii*—*Arctia caia*.  
*Euverna clio* (Pack.)  
*Halisidota agassizii*—*maculata*.  
*alni*—*maculata*.  
*argentata*—*Euschausia*.  
*californica*—*maculata*.  
*edwardsii*—*Hemihyalea*.  
*maculata* (Harr.)  
*roseata*—*Aemilia*.  
*sobrina*—*Euschausia*.  
*euschansia*—*Argentata*.  
*Haploa lecontei* (Boisd.)

- Hemihyalea edwardsii* (Pack.)  
*Hyphantria textor* Harr.  
*Isis isabella* (S. & A.)  
*Kodiosoma fulva* Stretch.  
     *eavesii*—fulva.  
     *nigra*—fulva.  
     *tricolor*—fulva.  
*Leptarctia albida*—Eustigmene.  
     *albofascia*—californiæ  
     *boisduvalii*—californiæ  
     *californica* Walk.  
     *decia*—californiæ  
     *dimidata*—californiæ.  
     *fulvo fasciata*—californiæ.  
     *lena*—californiæ.  
     *latifasciata*—californiæ.  
*Lerina incarnata* (Walk.)  
     *occidentalis*—californiæ.  
     *stretchii*—californiæ.  
*Leucarctia acraea*—Eustigmene.  
     *albida*—Eustigmene.  
     *californica*—*Isis isabella*.  
     *isabella*—*Isis*.  
     *permaculata*—*Turuptiana*.  
*Lophocampa*      *maculata*—*Halisodota*. *Turuptiana permaculata* Pack.
- Mænas vestalis* (Pack.)  
*Nemeophila cæspitalis*      *Paasemia*  
     *plantaginis*.  
     *chicorii*—*Parasemia plantaginis*.  
     *clio*—*Euverna*.  
     *modesta*—*Parasemia plantaginis*.  
     *petrosa*—*Parasemia plantaginis*.  
     *rufula*—*Diacrisia vagans*.  
*Noctua arge*—*Apantesis*.  
     *fuliginosa*—*Phragmatobia*.  
*Parasemia plantaginis* (Linn.)  
*Phæoptera cinnamomea*—*Æmilia*  
     *roseata*.  
     *quercus*—*Hemihyalea edwardsii*.  
     *salacis*—*Halisidota maculata*.  
*Phalæna isabella*—*Isis*.  
*Phobocisia reincarnata* Dyar.  
*Phragmatobia fuliginosa* (Linn.)  
     *vagans*—*Diacrisia*.  
*Platyprepia virginalis* (Boisd.)  
*Pygarcia elegans* (Stretch).  
*Pygostenucha terminalis* Walk.  
*Seirarctia clio*—*Euverna*.  
*Spilosoma vestalis*—*Haploa lecontei*.  
*Turuptiana permaculata* Pack.

## AGARISTIDÆ.

A family of day flying moths with dark wings on which are large white or yellow spots. *Alypia octomaculata* feeds on grape and ampelopsis and *A. mariposa* on the flower buds of *Clarkia elegans*.

## SYNOPSIS OF GENERA.

- Alypia. Pseudalypia*: hind wings unspotted. *Alypoides*: hind tibiæ smooth scaled. *Androloma*: costa swollen.
- Agarista dispaci*—*Alypia*.  
     *gutatta*—*Alypia*.  
     *langtonii*—*Alypia*.
- lorquini*—*Androloma maccullochii*.  
     *mariposa*—*Alypia*.
- Alypia* 1775 *octomaculata*. (65) 1864 *ridingsii*: (68) front tibiæ not orange. 1865 *langtoni*: (68) *octomaculata*—markings of hind wings yellow. 1868 *mariposa*: *ridingsii*—white markings traversed by black veins. *dipsaci*: *langtoni*—hind wing with yellow subdorsal spot.
- Alypia brannari*—*Androloma*.  
     *conjuncta*—*Androloma maccullochii*.  
     *dipsaci* G. & P.  
     *gutatta* (unidentified).  
     *langtonii* Coup.  
     *lorquini*—*Androloma*.  
     *mariposa* (G. & R.).  
     *octomaculata* (Fabr.).
- ridingsii* (Grote).  
     *sacramenti*—*langtonii*.  
     *similis*—*Androloma maccullochii*  
*Alypoides bimaculata* (H.S.)  
*Androloma brannani* (Stretch)  
     *maccullochii* (Kirby).  
     *similis*—*maccullochii*.  
*Pseudalypia crotchii* Edw.  
*Zygena octomaculata*—*Alypia*.

## NOCTUIDÆ.

The largest family of the order, including the cut worms which are general

feeders. The moths have a series of markings uniform enough to be of great value in classification, and to have received a distinct nomenclature. A series of lines paralleling the outer margin are known as the subterminal, postmedian and antemedian abbreviated to st. pm. and am. lines. Just behind the base of the cell there is a dark streak often present, lying at right angles to the lines and known as the basal streak. There are also three spots known claviform just behind the cell, orbicular within the cell and reniform at the tip of cell; the names indicating their usual shape.

Monograph: Hampson Cat. Lep. Phal. British Mus. Vol. IV—

- Abagrotis erratica—Triphæna.  
 Ablepharon absidum—Copablepharon.  
 Acerra addenda—Monima.  
   behrensiana—Xylomania.  
   erythrolita—Xylomania.  
   muricina (Oregon).  
   mys—Monima.  
   normalis—Perigrapha.  
   plusiiformis (Colorado).  
   pulchella—Perigrapha.  
   transparens—Perigrapha.  
 Aconitia angustipennis—Conaconia.  
   areli—Tarache.  
   arizoniæ—Tarache elegantula.  
   behrii—Tarache.  
   coquilletti—Tarache.  
   elegantula—Conochares.  
   flavipennis—Tarache.  
   gonella Tarache.  
   lucasi Tarache.  
 Acronycta felina (Grote).  
   frigida Smith.  
   hesperina Smith.  
   impleta Walk.  
   lepusculina (eastern).  
 Agrotis 1776 ypsilon. 1880 havilæ: hind wings brown. The former a common cut worm.  
 Agrotis abnormalis—Tarachidia.  
   abnormis—Euxoa.  
   æneipennis—Feltia.  
   æqualis—Euxoa wilsonii.  
   agrostis—Euxoa.  
   albipennis—Euxoa.  
   alticola—Euxoa.  
   annexa—Feltia.  
   apposita—Euxoa.  
   atomarius—Euxoa.  
   atrifera—Euxoa.  
   auxiliaris—Euxoa agretis.  
   bicollaris—Euxoa.  
   brevipennis—Euxoa.  
   brunneigera—Euxoa.  
   carissima—Triphæna.  
   catenula—Porosagrotis.  
   cicatrosa—Euxoa.  
   cinereicollis Grote.  
   clandestina—havlæ.  
   clemens Smith.  
   cogitans—Euxoa choris.  
   colata—Euxoa.  
   costata—Triphæna.  
   crenulata—Triphæna.  
   cupidissima—Triphæna.  
   discoidalis—Triphæna.  
   divergens—Euxoa.  
   erratica—Triphæna.  
   emarginata—Triphæna formalis.  
   euroides—Euxoa venusta.  
   evanidalis—Feltia.  
   lithospila Grote.  
   lupina—Merolonche.  
   mansueta Smith. ..  
   marmorata Smith.  
   ethelia Smith.  
   pacifica Smith.  
   perdita Grote.  
   quadrata Grote.  
   simplex—xylomania.  
   spinea—Merolonche.  
 Actinotia stewarti—Delta.  
 Adelphagrotis apposita—Eurois.  
   indeterminata—Eurois.  
   quarta—Eurois.  
 Admetovis oxymorus Grote.  
   similis Barnes.  
 Adonisea languida—Heliothis pulchripennis.  
   pulchripennis—Heliothis.  
 Aedophron pallens Smith.  
 Agassizia urbicolor Behr.  
 Agriopodes viridata (Harv.).  
 Agroperina cogitata (Walk.).  
 Agrophila tortricina Zell.

excellens—*Euxoa*.  
 exsertistigmus—*Triphæna*.  
 facula—*Triphæna* *formalis*.  
 fauna—*Euxoa*.  
 fenisica—*Euxoa*.  
 formalis—*Triphæna*.  
 friabilis—*Euxoa*.  
 furtivus—*Euxoa*.  
 fuscigera—*Euxoa*.  
 gagates—*Euxoa*.  
 gravis—*Feltia*.  
 haviæ Grote.  
 hollemanii—*Euxoa*.  
 incallida—*Euxoa*.  
 incivis—*Peridromia*.  
 inelegans—*Triphæna*.  
 infimatis—*Anomogyna*.  
 infelix—*Euxoa* *excellens*.  
 innotabilis—*Eurois* *indeterminata*.  
 insignata—*Euxoa*.  
 intrita—*Euxoa*.  
 introferens—*Euxoa* *auxiliaris*.  
 lacunosa—*Euxoa*.  
 lætula—*Triphæna*.  
 lagena—*Euxoa*.  
 lutulenta—*Euxoa*.  
 malefida—*Feltia*.  
 mercenaria—*Euxoa* *agrestis*.  
 messoria—*Euxoa*.  
 micronyx—*Euxoa*.  
 milleri—*Feltia*.  
 mimallonis—*Porosagrotis*.  
 nostra—*Euxoa*.  
 observabilis—*Triphæna* *exsertistigma*.  
 orbis—*Triphæna* *variata*.  
 oblata Morr.  
 germana Edw.  
 lithosina Edw.  
 mera Harv.  
 miona Smith.  
 salicis arvalis.  
 superba Edw.  
 oblongistigma—*Euxoa*.  
 pallidicollis—*cinereicollis*.  
 perfusca—*Euxoa*.  
 plagigera—*Euxoa*.  
 punctigera—*Euxoa*.

pyrophiloides—*Noctua*.  
 quadridentata—*Euxoa*.  
 quarta—*Eurois*.  
 quinquelinea—*Euxoa*.  
 radix—*Polia*.  
 recula—*Euxoa*.  
 rema—*Euxoa*.  
 remota—*Euxoa*.  
 rena—*Euxoa*.  
 rosaria Grote.  
 rufipectus—*Triphæna*.  
 satis—*Euxoa*.  
 segregata—*Euxoa*.  
 sierræ How.  
 serricornis—*Euxoa*.  
 silens—*Euxoa*.  
 specialis—*Euxoa* *wilsoni*.  
 spectranda—*Euxoa* *verticalis*.  
 tesselloides—*Euxoa*.  
 vaucouverensis—*Feltia*.  
 variata—*Triphæna*.  
 venerabilis—*Feltia*.  
 verticalis—*Euxoa*.  
 vorax—*Homonocnemis* *fortis*.  
 vernalis—*Anomogyna*.  
 volubilis—*Feltia*.  
 wilsoni—*Euxoa*.  
 ypsilon Rott.

*Amathus* *bicolorago* (Guen.)  
*fornica* (Smith).  
*purpurea* (Grote).  
*Amphipyra* *glabella* (Morr.)  
*pyramioides* Guen.  
*Anarta* *kelloggi*—*Symphistis*.  
*mimuli* Behr.  
*Andropolia* *maxima* (Dyar.)  
*olorian* (Grote).  
*theodora* (Grote).  
*Annaphila* *amicula*—*decia*.  
*arvalis* Edw.  
*aurantiaca*—*Incita*.  
*danistica* Grote.  
*casta* Edw.  
*decia* Grote.  
*depicta* Grote.  
*diva* Grote.  
*divinula* Edw.  
*domina* Edw.

*Anomogyna* 1879 *vernilis*. 1880 *infimitalis*: front wings tinged with rufus.

*Anomogyna* *infimatis* (Grote.)  
*vernilis* (Grote).

*Antapлага* *koebelei* Ril.

*Anytus* 1857 *privata*. 1888 *evelina*: front wings dark. The latter feeds on Lupines and Ribes.



- Anytus evalina* (French.)  
     *privata* (Walk.).  
     *sculptus*—*privata*.  
*Apamea cogitata*—*Agroperina*.  
     *lunata* Smith.  
     *nictitans* (Linn.).  
*Apatela felina*—*Acronycta*.  
     *frigida*—*Acronycta*.  
     *hesperida*—*Acronycta*.  
     *impleta*—*Acronycta*.  
     *lepusculina* (eastern)  
     *lupina*—*Merolonche*.  
     *mansueta*—*Acronycta*.  
     *marmorata*—*Acronycta*.  
     *pacifica*—*Acronycta*.  
     *perdita*—*Acronycta*.  
     *quadrata*—*Acronycta*.  
     *spinea*—*Merolonche*.  
     *theodori*—*Andropolia*.  
*Aporophila yosemitæ* Grote.  
*Archenaria alameda* (Smith.)  
*Arisolonche albovenosa* (Goez.)  
*Arthrochlora feburalis*—*Monophana*.  
*Aspila subflexa*—*Chloridia virescens*.  
*Athetis drasteroides* (Smith.)  
*Atethmia canescens*—*Calymnia orina*.  
*Auchmis confusa*—*Morrisonia*.  
*Autographa albavitta* Ott.  
     *biloba* Steph.  
     *brassica* (Ril.).  
     *falcigera* Kirby.  
     *gamma* (Linn.).  
     *labrosa* (Grote).  
     *ou* (Guen.).  
     *pasiphæia* Grote.  
*Axenys amplus*—*arvalis*.  
     *arvalis* (Grote).  
     *ochraceus*—*arvalis*.  
*Balsa albopunctella* Walk.  
*Behrensia conchiformis* Grote.  
*Bolina cinis* (undetermined).  
     *hadeniformis* (unidentified).  
     *jucunde* (unidentified).  
*Bombycia curvifascia* (Smith.)  
     *elda* (French.)  
*Bombyx odora*—*Erebus*.  
*Bomolocha incusalis*—*Pleonectyptera*.  
*Brachylomia rectifascia* (Smith.)  
*Bryomima fallax* (Smith.)  
*Bryophila fascia* (Smith.)  
     *viridata*—*Agriopodes*.  
*Chloridea* 1781 *virescens*. 1827 *armigera*: front wings without oblique am.  
 m. and pm. lines. 1867 *phloxiphaga*: hind wings with large black discoidal  
 spot. The corn worm, *armigera*, is a great pest on sweet corn and tomatoes  
*Cabaloides franciscana* (Smith.)  
*Cabalos franciscanus*—*Cabaloides*.  
*Cænurgia adversa* (Grote.)  
*Calymnia orina* (Guen.)  
*Capnodes californica* Behr.  
*Caradrina drasteroides*—*Athetis*.  
     *exigua* Huebn.  
     *extimia* *Athetis*.  
     *flavimacula*—*Laphygma*.  
     *glabella*—*Amphipyra*.  
     *leucorena* *Namangana*.  
     *miranda* *Proxenus*.  
*Carneades*—*Euxoa*.  
*Catocala adromache* Edw.  
     *adulterata* (not authentic).  
     *aholibah* Stretch.  
     *aspasia* Stretch.  
     *augusta*—*aspasia*.  
     *californica* Edw.  
     *cleopatra*—*californica*.  
     *electilis*—*californica*.  
     *faustina* Stretch.  
     *francesca*—*mariana*.  
     *fratercula* G & R.  
     *hermia* Edw.  
     *hippolytia* Edw.  
     *ilia* (Cram).  
     *irene*—*californica*.  
     *jessica* Edw.  
     *junctura* (eastern).  
     *mariana* Edw.  
     *marmorata* Edw.  
     *perdita*—*faustina*.  
     *portia*—*stretchii*.  
     *relicta* Walk.  
     *stretchii* Behr.  
     *verilliana* Grote.  
     *virgilia*—*irene*.  
     *volumina*—*irene*.  
     *zoe*—*ilia*.  
*Cea cirphidia* Ham.  
*Cerapoda oblita* (Grote.)  
*C læna contrahens*—*Eriopyge*.  
*Cerma fascia*—*Bryophila*.  
     *olivacea* Sm.  
*Chabulata fistula* (Harv.)  
*Charadra decora* Morr.  
     *extimia* Walk.  
     *miranda* Grote.  
*Cheophora blanda*—*Mythimna*.

virescens feeds on solenaceæ and phloxiphaga on Grindelia.

**Chloridea armigera** (Hueb.)  
*phloxiphaga* (G. & R.).  
*subflexa virescens*.  
*virescens* Fabr.

*Chorizagrotis agrestis*—**Euxoa**.  
*auxiliaris*—**Euxoa**.  
*introferens*—**Euxoa auxiliaris**.  
*Chytonix parvamacula* Smith.

**Cirphis** 1809 *unipuncta*. 1852 *insueta* (79 81) no white spot at lower angle of cell. 1879 *dia*: *insueta*—front wings not tinged with red. 1881 *farcta*: (02) *insueta*—abdomen not reddish beneath. 1902 *palliseca*: *farcta*—blackish bands on tibial spur. *C. unicolor* is the army worm, perhaps the most injurious member of the family. Feeds largely on alfalfa, often migrates into vineyards after cutting.

**Cirphis** *dia*. (Grote.)  
*farcta* (Grote.)  
*insueta* (Guen.)  
*palliseca* (Smith).

**Cirrhobolina mexicana** (Edw.)  
*tetrica* (Edw.).

**Cissura biformata** (Edw.)  
*scropulosa* (Edw.)  
*subtermina* (Sm.).

**Cleoceris curvifascia**—**Bombycia**.  
*alda*—**Bombycia**.  
*rectifascia*—**Brachylomia**.

**Cleophana eulepis**—**Copicucullia**.  
*occata*—**Oncocnemis**

**Cobaloides angelicus** Smith.  
*franciscanus* Smith.

**Conacontia angustipennis** (Grote.)

**Conochara altera** (Smith.)  
*elegantula* (Harv.).  
*interrupta* Smith.

**Copablephron absidium** (Harv.)

**Copibryophila angelica** Smith.

**Copicucullia eulepis** (Grote.)

**Cosmia orina**—**Calypnia**.  
*sambuci*—**Zotheca tranquila**.

**Cadrina drasteroides**—**Athetis**.

**Eriopyge** 1860 *contrahens*. (87) 1874 *puerilis*: front wings tinged with purplish red. *rufula*: front wings purplish red. 1879 *perbrunnea*: *rufula*—orbiculi very indistinct. 1887 *irrorata*: male with long downturned hair on under side of front wings. 1890 *curta*: antennæ of male bipectinate. 1905 *affructa*: pm. line outcurved to vein 4 and then incurved.

**Eriopyge affructa** Ham.  
*contrahens* (Walk.).  
*curtica* (Smith).  
*irrorata* (Smith).  
*perbrunnea* (Grote).  
*puerilis* (Grote).  
*rufula* (Grote).

**Crimona pallimedia** Smith.  
*Cucullia serraticornis* Lint.  
*solidaginis* Behr.

*Cyathissa pallida*—**Emarginea**.

*Dargidia procinctus*—**Hadena**.

*Delta stewarti* (Grote.)

*Deva palligera*—**Panchrysa**.

*Dianthæcia insolens*—**Polia**.

*leucogramma*—**Polia**.

*reifula*—**Eriopyge**.

*Dicestra chartarina* (Grote).

*Dicopsis damnalis*—**Eutolype**.

*Drasteria cærulea* Grote.

*Dryobata apina*—**Dryotype**.

*curvifascia*—**Bombycia**.

*elda*—**Bombycia**.

*rectifascia*—**Brachylomia**.

*Dryotype apina* (Grote.)

*Dysocnemis prurupta* (Grote.)

*oregonica* (Edw.).

*Emarginea pallida* (Smith.)

*Epia minorata* (Smith.)

*Eplzeuxis lubricalis* (Geyer.)

*Erebus odora* (Linn.)

*Eremobia uncinata* (Smith.)

**Eudryas brevipennis** Stretch.  
*Euharveya carbonaria* Harv.  
*Euherrichia cervina*—**Protophena**.  
*Eumestleta carmelita* Morr.  
*daria* (Druce).

**Euplexia lucipara** (Linn.)

*Eupsephopæctes procinctus*—**Hadena**.

**Eurois** 1865 *indeterminata*. 1878 *apposita*: front wings without black basal streak.

- Eurois apposita* (Grote.)  
*indeterminata* (Walk.).  
*pluviosa*—*Parastichtis arctica*.  
*quarta* (Grote.)  
*Euros proprius*—*Symphistis*.  
*Eustrotia includens* (Walk.)
- penita—includens.  
*Euthisanotia brevipennis*—*Eudryas*.  
*Eutolype dramalis* (Grote.)  
 perscripta—*Lepipolis*.  
*Eutricopsis naxilis* Morr.
- Euxoa* 1841 *messoria*. (65 74 75 78) 1856 *insignata*: (74 75 90) front wings not densely irrorate with dark. *divergens*: (65 78 90 91 00) front wings with cell dark between stigmata.  
 1865 *vetusta*: (76) *divergens*—front without black basal dash. *septentrionalis*: *messoria*—front wings with well defined series of dark dentate marks before st. line. *punctigera*: (74 75 83 87 90) *messoria*—front wings without median shade. *quadridentata*: (74 76) veins 3, 4, 6 and 7 of front wings defined by pale streaks strongly indenting the st. line. *cicatrosa*: *quadridentata*—front wings with stigma and submedian fascia clear yellow.  
 1873 *auxillaris*: antennæ of male not strongly serrate and fasciculate.  
 1874 *fuscigera*: *insignata*—hind wings not wholly tinged with brown. *intrita* (75) *messoria*—front wings dark brown. *hollemanii* (78) *punctigera*—tegulae with prominent median band or shade. *plagigera* (87) *quadridentata* hind wings wholly suffused with brown.  
 1875 *brunnigera* (90) *insignata*—orbicular and reniform without dark centers. *friabilis*: *intrita*—hind wings almost entirely white in the male. *fenipunctigera*—front wings reddish brown.  
 1876 *satis*: (77 80 81 90) *vetusta*—hind wings entirely suffused with brown. *fauna*: *insignata*—front wings with lines indistinct. *recula*: *quadridentata*: orbicular v-shaped, open above.  
 1877 *albipennis*: *satis*—hind wing of male white with brown terminal line, of female wholly suffused with brown.  
 1878 *atrifera*: (80) *divergens*—hind wing of male whitish, terminal area suffused with brown. *micronyx* (90) *messoria*—hind wings nearly entirely suffused with brown. *bicollaris*: (00) *hollemanii*—orbicular and reniform not confluent.  
 1880 *tesselloides* (00) *atrifera*—ground color of front wings grey. *verticalis*: *satis*—hind wings of both sexes white, terminal areas tinged with brown.  
 1881 *collata*: (00) *satis*—orbicular open above,  
 1883 *perfusca*: *punctigera*—stigmata defined by blackish.  
 1887 *serricornis*: *punctigera*—front wings rufus, without dark irrorations. *oblongistigma*: *plagigera*—front wings with cell suffused with black. *brevipennis* (94) *quadridentata*—orbicular oblong.  
 1890 *furtiva*: (00) *divergens*—orbicular v-shaped. *intrusa*: *satis*—front wings with cell prominently black. *nostra*: *satis*—front wing with terminal area blackish. *rena*: *satis*—no dark band on tegula. *incallida*: *brunnigera*—front wings brownish grey. *lutulenta*: *insignata*—median shade prominent. *quinquelineata*: *micronyx*—claviform not well defined. *remota*: (00) *punctigera*—front wings with ground color grey.

1891 **fusimacula**: **divergens**—front wings with reniform confluent or nearly so with orbicular.

1894 **segregata**: **brevipennis**—front wings tinged with reddish brown.

1900 **compressipennis**: **divergens**—ground color of front wings reddish brown. **Cæsia**: **divergens**—no white streak on median vein of front wing. **silenis**: **tesselloides**—lines about obsolete. **laminis**: **tesselloides**—**tegulæ rufus** at base. **vanidica**: **furtiva**—front wing with oblique yellow streak from end of claviform. **noctuiiformis**: **collata**—front wings brown. **tocoyæ**: **feniseca**—front wings yellow suffused with brick red. **relaxa**: **feniseca**—front wings pale fuscous tinged with rufous. **nævula**: **remota**—front wings without rufous tint. **fulda**: **nævula**—front wing with terminal area dark. **loya**: **bicollaris**—front wings not brown. **nevada**: **hollenmani**—front wings with costal area concolorous.

**Euxoa** **abnormis** (Smith).  
**acutifrons** (Smith).  
**agrestis** (Grote).  
**albipennis** (Grote).  
**alticola** (Smith).  
**atomaris** (Smith).  
**atrifer** Grote.  
**auxiliaris** (Grote).  
**bicollaris** Grote.  
**bifirmata** Smith.  
**brevipennis** (Smith).  
**brunniegera** (Grote).  
**cæcius** (Smith).  
**choris** (Smith).  
**cicatrosa** (Grote).  
**cinereopallida** Smith.  
**cogitans** (Smith).  
**colata** Grote.  
**compressipennis** (Smith).  
**divergens** (Walk.).  
**excellens** (Grote).  
**fauna** (Morr.).  
**feniseca** (Harv.).  
**flutea** Smith.  
**friabilis** (Grote).  
**fulda** (Smith).  
**furtiva** (Smith).  
**fuscigera** Grote.  
**fusimacula** Smith.  
**gagates** (Grote).  
**henrietta** (Smith).  
**hollemani** (Grote).  
**incallida** (Smith).  
**incubita** (Smith).  
**insignata** (Walk.).  
**insulsa**—**messoria**.  
**intrita** Mor.

**intrusa** (Smith).  
**lacunosa** (Grote).  
**lagena** (Grote).  
**laminis** (Smith).  
**loya** (Smith).  
**lutulenta** (Smith).  
**messoria** (Harr.).  
**micronyx** (Grote).  
**nævula** (Smith).  
**nevada** (Smith).  
**noctuiiformis** (Smith).  
**nostra** (Smith).  
**oblongistigma** (Smith).  
**perexcellens**—**excellens**.  
**perfusca** (Grote).  
**plagigera** (Morr.).  
**punctigera** Walk.  
**quadridentata** (G. & R.)  
**quinquelinea** (Smith).  
**recula** (Harv.).  
**relaxus** (Smith).  
**remota** (Smith).  
**rena** (Smith).  
**satis** Harv.  
**segregata** (Smith).  
**selenis** (Smith).  
**septentrionalis** (Walk.).  
**serricornis** (Smith).  
**silens** Grote.  
**spectanda**—**verticalis**.  
**tesselloides** Grote.  
**tocoyæ** (Smith).  
**vanidica** (Smith).  
**verticalis** (Grote).  
**vestuta** Walk.  
**wilsonii** (Grote).

**Fala** **phycophora** Grote.

**Feltia** 1825 **annexa**. (73 78) 1852 **malefida**: (56) claviform filled in with



black. 1856 *venerabilis*: malefida—hind wings brown. 1873 *vancouverensis*: (74 75) *annexa*—hind wings brown. 1874 *gravis*: *vancouverensis*—head dark. *volubilis*: (76) *vancouverensis*—lines indistinct. 1875 *milleri*: *vancouverensis*—head not ferruginous. 1876 *æneipennis*: *volubilis*—front wings without dark streak beyond the reniform. 1878 *evanidalis*: *annexa*—orbicular v-shaped

*Feltia æneipennis* (Grote.)

*annexa* (Triet.).

*evanidalis* (Grote).

*gravis* (Grote).

*malefida* (Guen.).

*milleri* (Grote).

*vancouverensis* (Grote).

*venerabilis* (Walk.).

*volubilis* (Harv.).

*Feralia febralis*—*Moniphana*.

*Fruva acerba*—*Trachea*.

*modesta* Edw.

*Galgula partita* Guen.

*Glæa olivata*—*Psectraglæa*

*Gortyna albilunata*—*Apamea lunata*.

*nititans*—*Apamea*.

*obliqua*—*Hydroecia*.

*sawzalltæ*—*Ochria*.

*Græparia megocula* (Smith.)

*Graphiphora arthrolita*—*Monima*.

*behrensiana*—*Xylomania*.

*curtica*—*Eriopyge*.

*erythrolita*—*Xylomania*.

*furfurata*—*Eriopyge affurata*.

*muricina* (Colorado).

*normalis*—*Perigrapha*.

*pacifica*—*Monima*.

*pectinata*—*Perigrapha*.

*perbrunnea*—*Eriopyge*.

*præses*—*Perigrapha*.

*puerilis*—*Eriopyge*.

*pulchella*—*Perigrapha*.

*rubica*—*Xylomania*.

*terminata*—*Perigrapha*.

*Graptolita contenta* (Grote.)

*dilatocula* (Smith).

*gausapata* (Grote).

*oregonensis* (Harv.)

*puella* (Smith).

*Gyros muirii* (Edw.)

*Hadena adnixa*—*Trachea*.

*albina*—*Parastichtis*.

*antennata*—*Parastichtis*.

*binotata*—*Trachea*.

*castanea*—*Parastichtis arctica*.

*catalina*—*Trachea*.

*centralis*—*Trachea*.

*cinefacta*—*Trachea*.

*cogitata*—*Agroperina*.

*cuculiformis*—*Parastichtis*.

*curvata*—*Trachea binotata*.

*cymosa*—*Parastichtis castanea*.

*devastatrix*—*Sidemia*.

*didonea*—*Xylomania*.

*divesta*—*Trachea*.

*evelina*—*Anytus*.

*ethnica*—*Trachea*.

*fumcola*—*Trachea*.

*genetrix*—*Trachea*.

*genialis*—*Parastichtis*.

*glorina*—*Polia*.

*inconspicua*—*Trachea paviae*.

*indirecta*—*Trachea*.

*laevigata*—*Oligia*.

*mariana*—*Trachea*.

*mustelina*—*Trachea*.

*occidens*—*Parastichtis*.

*olorina*—*Andropolia*.

*pausis*—*Trachea*.

*pavia*—*Trachea*.

*pluviosa*—*Parastichtis arctica*.

*procincta* (Grote).

*rectifascia*—*Cleoceris*.

*relicina*—*Parastichtis*.

*stricta*—*Polia*.

*susquesa*—*Trachea*.

*tusa*—*Trachea*.

*unienicta*—*Eremobia*.

*violacea*—*Oligia*.

*Hecatera laudabilis*—*Polia*.

*Hagena cuculiformis*—*Parastichtis*.

*Helia occidentalis*—*Epizreuxis lubricalis*.

*Heliaca diminutiva*—*Heliothodes*.

*nexilis*—*Eutricopsis*.

*ranunculi*—*Xanthothrix*.

*Heliodes angelica* Smith.

*restrictalis*—*Microhelia*.

*Heliosea pictipennis* Grote.

*Heliolonche modicella* Grote.

*Heliophana amaryllis* Smith.

*Heliophila dia*—*Cirphis*.

*farcta*—*Cirphis*.

*heteradoxa*—*Cirphis insueta*.

*megadia*—*Cirphis dia*.

*minorata*—*Leucania*.

*oxygale*—*Leucania*.

*palliseca*—*Cirphis*.

*unipuncta*—*Cirphis*.

*Heliosea pictipennis* (Grote.)

- Heliothis armiger**—**Chloridia**.  
 californica—sueta.  
 celeris (Grote).  
 crotchii—**Schinia cupes**.  
 diminutiva—**Heliothodes**.  
 græfiana (Tep.)  
 lanul—**Schinia**.  
 pulchripennis (Grote).  
 phlogophagus—**Chloridia** phlox-  
 iphaga.  
 prurptus—**Dysocnemis**.  
 sueta (Grote).  
 vacciniæ (Edw.)  
 villosa (Grote).  
**Heliothodes diminutivus** (Grote.)  
 fasciata (Edw.).  
**Herrichia cervina**—**Protophana**.  
**Heterogramma palligera**—**Tetanolita**.  
**Himella furfurata**—**Eriopyge affurata**.  
**Homoglæa californica** (Smith).  
 carbonaria (Harv.).  
**Homobadena chorda**—**Oncocnemis**.  
 deserta—**Litocala sexsignata**.  
 elda—**Bombycia**.  
**Lasionycta** 1879 arietis. 1880 defessa: claviform well developed.  
**Lasionycta arietis** (Grote.)  
 ochracea (Grote).  
**Leucania dia**—**Cirphis**.  
 faretæ—**Cirphis**.  
 henrici—**Simyra**.  
 heterodoca—**Cirphis insueta**.  
**Leucania** 1758 pallens. 1881 oxygala: hind wings uniformly tinged with  
 fuscous. 1894 minorata: front wing with fuscous shade below median vein.  
**Perigonica** 1890 angulata. 1902 tertia: male antennæ bipectinate.  
 edwardsii—**Syneda**.  
 maculosa—**Syneda**.  
 nubicula—**Syneda**.  
 ochracea—**Syneda**.  
 stretchii—**Syneda howlandii**.  
 socia—**Syneda**.  
 tejonica—**Syneda**.  
**Litholomia napæa** (Morr.)  
**Lycophonta** 1809 margarintosa. 1852 lubricans: (03) reniform small. 1903  
 radiola: lubricans—front wings not reddish.  
**Lycophontia lubricans** (Guen.)  
 margaritosa (Harv.)  
 radiola Ham.  
**Lygranthœcia** 1864 mortua. 1893 intrabilis: hind wings orange.  
**Lygranthœcia intrabilis** (Smith.)  
 mortua (Grote).  
 saturata—**Schinia**.  
**Lythrodos discistriga**—**Hoplolythra**.  
**Mamestra albogutta**—**Polia**.  
 figurata, **Oncocnemis**.  
 fortis—**Homococnemis**.  
 picina—**Homococnemis fortis**.  
**Homococnemis fortis** (Grote.)  
**Homoptera salicis**—**Phæcyma**.  
 rosæ—**Phæcyma salicis**.  
 rubi—**Phæcyma**.  
**Hoplolythra discistriga** (Smith.)  
**Hydrœcia albilunata**—**Apamea lunata**.  
 angelica—**Papaipema**.  
 lunata—**Apamea**.  
 obliqua (Harv.).  
 pacifica—**Apamea nictitans**.  
**Hypena californica** Behr.  
 decorata—californica.  
 modesta Smith.  
**Hyssia niveoguttata** (Grote.)  
 incita aurantiacus (Edw.)  
**Ingura cristatrix**—**Pæctes**.  
 declinata—**Pæctes**.  
**Jaspidia viridata**—**Agriopodes**.  
**Laphrygma flavimaculata** Harv.  
**Lepipolys perscripta** Guen.  
 behrensi (Grote).  
 minorata Smith.  
 oxygala (Grote.)  
 pallens (Linn.).  
 unipuncta—**Cirphis**.  
**Leucanitis adumbrata**—**Syneda**.  
**Lithophane carbonaria**—**Homoglæa**.  
 contenta—**Graptolitha**.  
 gausapata—**Graptolitha**.  
 oregonensis—**Graptolitha**.  
**Lithocala sexsignata** Harv.  
 litosea adversa—**Cœnurgia**.  
 luperina posticata (Harv.)

comis—*Polia olivacea*.  
 crotchii—*Polia*.  
 cuneata—*Polia*.  
 davena—*Polia olivacea*.  
 defessa—*Scotogramma*.  
 dimmocki—*Polia radix*.  
 discalis—*Polia*.  
 incolens—*Polia*.  
 insulsa—*Euxoa messoria*.  
 invalida—*Polia*.  
 laudabilis—*Polia*.  
 lepidula—*Polia*.  
 leucogramma—*Polia*.  
 minorata—*Epia*.  
 nevadae—*Polia*.  
 niveiguttata—*Hyssia*.  
 noverca—*Polia*.  
 olivacea—*Polia*.  
 passa—*Polia*.  
 pensilis—*Polia*.  
 puerilis—*Eriopyge*.  
 punctigera—*Euxoa*.  
 quadrata—*Polia*.  
 quadrillineata—*Polia*  
*radix*—*Polia*.  
 rectilinea—*Polia olivacea*.  
 rubrica—*Xylomania*.  
 septentrionalis—*Euxoa*.  
 stricta—*Polia*.  
 subapicalis—*Xylomania perlub-*

*ens*.  
 trifolii—*Scotogramma*.  
 unipuncta—*Cirphis*.  
 u-scripta—*Trichoclea*.  
 ventusta—*Euxoa*.  
 vicina—*Polia*.

*Melanoporphyrina proruptione Grote*.  
*Melichleptria californiensis*—*Heliothis*  
*sueta*.

*celeris*—*Heliothis*.  
*fasciata*—*Heliothodes*.  
*oregonica*—*Dysocnemis*.  
*græfiana*—*Heliothis*.  
*perminuta*—*Pseudotamilia*.  
*proruptione*—*Melanoporphyrina*.  
*pulchripennis*—*Heliothis*.  
*sueta*—*Heliothis*.  
*vacciniæ*—*Heliothis*.  
*villosa*—*Heliothis*.

*Meliopota bolino*—*jucunda*.  
*cinis*—*jucunda*.  
*hadeniformis*—*jucunda*.  
*jucunda* (Hubn.).

*Merolonche lupina* (Grote).  
*ursina* S. & D.  
*spinea* (Grote).

*Metalepsis cornuta* (Grote).  
*Microhelia restrictalis* (Smith).  
*Miodera stigmata* Smith.

*Monima* 1820 addenda. 1874 *arthrolita*: male antennæ fasciculate. *pacifica*:  
*arthrolita*—st. line pale. 1902 *nys*: male antennæ bipectinate.

*Monima addenda* (Smith).  
*arthrolita* (Harv.).  
*mys* (Dyar).  
*pacifica* (Harv.).

*Monophana februalis* (Grote.)

*Morrisonia confusa* (Hubn.).  
*peractua* Morr.

*Mythimna blanda* (Grote).

*Namangana alfceni* (Grote).  
*leucorena* (Smith).

*Nephelodes mimians* Guen.

*Nocloca nesæa* (Smith)  
*rivulosa* Smith.

*Noctua armigera*—*Chloridia*.

*albovenosa*—*Arsilonche*.

*clemens*—*Agrotis*.

*gamma*—*Autographa*.

*havlæ*—*Agrotis*.

*lucipara*—*Euxplexia*.

*lubricans*—*Lycophotia*.

*margaritosa*—*Lycophotia*.

*nictitans*—*Apamea*.

*oblata*—*Agrotis*.

*odora*—*Erebus*.

*pallens*—*Leucania*.

*pallidicornis*—*Agrotis cinnerei-*  
*collis*.

*pyrophiloides* Harv.

*rosaria*—*Agrotis*.

*saucia*—*Peridromia*.

*virescens*—*Chloridea*.

*sierræ*—*Agrotis*.

*Nonagria alameda*—*Archenaria*.

*Ochria sauzælitæ* Grote.

*Oligia lævigata* (Smith).

*violacea* (Grote).

*Omia nesæa*—*Nocloca*.

*Oncocnemis albifasciatus* Ham.

*aqualis* (Grote).

*aterrima*—*Pseudocontia*.

*angustata* Harv.

*behrensi*—*Lepipolis*.

*chorda* (Grote).

*corusca* Smith.

*exemplaris* (Smith).

*fasciatus*—*albifasciatus*.

- figurata* Ham.  
*fortis*—*Homonocnemis*.  
*fragmantis* Smith.  
*gracillinea*—*Oxycnemis*.  
*hayesi* Grote.  
*major* Grote.  
*menantho* Smith.  
*mirificalis* Grote.  
*oblita*—*Cerapoda*.  
*occata* (Grote).  
*pophono* Smith.  
*Orrhodia californica*—*Homoglaea*.  
*irrorata*—*Eriopyge*.  
*Orthodes puerilis*—*Eriopyge*.  
*Orthosia bicolorago*—*Amathes*.  
*formica*—*Amathes*.  
*hamifera*—*Perigrapha transpar-*  
*ens*.  
*posticata*—*Luperina*.  
*purpurea*—*Amathes*.  
*Oxynesis fusimacula* (Smith).  
*gracillinea* (Grote).  
*yuma*—*gracillinea*.  
*Pachnobia cinerascens* (Smith).  
*Perigrapha* 1876 *pulchella* (87) 1879 *præses* (81) antennæ of male fasciculate.  
1881 *transparens*: *præses*—inner margin of front wing crimson. 1887 *termin-*  
*ata*: *pulchella*—orbicular absent. *pectinata*: *terminata*—postmedian area of  
front wings concolorous. 1891 *prima*: antennæ bipectinate in both sexes.  
1894 *normalis*: reniform and orbicular confluent.  
*Perigrapha behrensiana*—*Xylomania*.  
*inferior*—*Stretchia*.  
*muricina* (Oregon).  
*normalis* (Grote).  
*pectinata* (Smith).  
*præses* (Grote).  
*prima* Smith.  
*pulchella* Harv.  
*terminata* (Smith).  
*transparens* (Grote).  
*Phæcocyma salacis* (Behr.).  
*tertia* Dyer.  
*Phalæna devastatrix*—*Sidemia*.  
*Phalæna devastatrix*—*Sidemia*.  
*Phæcocyma salacis* (Behr.)  
*rosæ*—*salacis*.  
*rubi* (Edw.).  
*Phoberia indiscreta* (Edw.).  
*ilia*—*Catocala*.  
*cornuta*—*Metalepsis*.  
*Pæctes cristatrix* (Guen.).  
*declinata* (Grote).  
*Palada scarletina* Smith.  
*Panthea portlandia* Grote.  
*Panchrysa palligera* (Grote).  
*Papaipema angelica* (Smith).  
*Paragrotis* (*Euxoa*).  
*Parastichtis albina* (Grote).  
*antennata* (Smith).  
*arctica* (Boisd.).  
*castanea* (Grote).  
*cuculliformis* (Grote).  
*genialis* (Grote).  
*occidens* (Grote).  
*relicina* (Morr.).  
*Peridromia demutabilis* (Smith).  
*incivis* (Guen.).  
*saucia* (Hubn.).  
*Perigea alfkenii*—*Namangana*.  
*falsa*—*Bryomima*.  
*mersa* (Morr.).  
*Perigonica angulata* Smith.  
*tertia* Dy r.  
*Phobolusia resincarineta* Dyar.  
*Pleonectopoda*—*Euxoa*.  
*Pleonectyptera finitima* Smith.  
*incusalis* Grote.  
*secundatis* Grote.  
*subflavidalis* Grote.  
*Pleroma cinerea* Smith.  
*obliquata* Smith.  
*Pleuronectyptera finitima* Smith.  
*Plusia brassica*—*Autographa*.  
*californica*—*Autographa gamma*.  
*gamma*—*Autographa*.  
*labrosa*—*Autographa*.  
*lenzi*—*metallica*.  
*metallica* Grote.  
*ou*—*Autographa*.  
*russea*—*Autographa gamma*.  
*Podagra crassipes* Smith

*Polia* 1852 *laudibilis*. (65 73) 1856 *radix*: (91) st. line dentate on veins 3 and 4 forming a distinct w-mark.

1865 *stricta*: (74) *laudabilis*—front wing with tip of median vein streaked with white.



1873 *quadrilineata* (77) *laudabilis*—ground color of front wings grey white. *cuneata*: (74 93) *laudabilis*—reniform large, kidney-shaped. *leucogramma*: (74 77 87) antennæ of male fasciculate.

1874 *olivacea*: *stricta*—front wings not reddish brown. *pensilis*: (05) claviform extending well below the cell. *passa* (76) prothorax with a divided crest. *insolens*: (05) *leucogramma*—front wing not reddish.

1876 *nevadæ*: (00) *passa*—front wings with distinct w-mark.  
1877 *alboguttata*: *quadrilineata*—am. and pm lines not approximate behind. *discalis* (50) *leucogramma*—prothorax with divided crest.

1878 *noverica*: *vicina*—reniform U-shaped.

1880 *crotchii*: *discalis*—front wings tinged with brown.

1887 *lepidula*: *leucogramma*—pm. line incurved below vein five.

1891 *quadrata*: *radix*—front front wings without black basal streak.

1893 *densa*: *cuneata*—ground color of front wings yellowish brown.

1900 *invalida*: *nevadæ*—front wings with am. and pm. lines conjoined by a black streak in submedian fold.

1905 *stenotis*: *pensilis*—ground color of front wings white. *canites*: *insolens*—ground color of front wings yellowish brown.

*Polia alboguttata* (Grote).

*canites* Ham.

*crotchii* (Grote).

*cuneata* (Smith).

*densa* (Smith).

*discalis* (Grote).

*insolens* (Grote).

*invalida* (Smith).

*laudabilis* (Guen.).

*lepidula* (Smith).

*leucogramma* (Grote).

*maxima*—*Andropolia*.

*nevadæ* (Grote).

*noverica* (Grote).

*olivacea* (Morr.).

*olorina*—*Andropolia*

*passa* (Morr.).

*pensilis* (Grote).

*privata*—*Anytus*.

*quadrata* (Smith).

*quadrilinea* (Grote).

*radix* (Walk.).

*stenotis* Ham.

*stricta* (Walk.).

*theodori*—*Andropolia*.

*vicina* (Grote).

*Polia olorina* (Grote).

*theodori* (Grote).

*Porosagrotis* 1873 *mimallonis*. 1879 *catenula*: pm. line reduced to a series of spots.

*Porosagrotis catenula* (Grote).

*milleri* Feltia.

*mimallonis* (Grote).

*Pronoctua pyrophiloides* Harv.

*Prodenia ornithogali* Guen.

*præfica* Grote.

*Protophana cervina* (Edw.).

*Pseudotamília* 1798 *vanella*. 1881 *perminuta*: no antemedian whitish band on hind wings.

*Pseudotamília perminuta* Edw.

*vanella* Grote.

*Pyrocleptria californica* Ham.

*Pyrophila glabella*—*Amphipyra*.

*Pyrria umbria* Hubn.

*Rancora matricaria*—*Cucullia serrati-cornis*.

*Proxenus miranda* (Grote)

*Psectraglæa olivata* (Harv.).

*Pseudoglæa blanda*—*Mythimna*.

*Pseudoglossa decepta*—*Mythimna blanda*.

*Pseudoglossa lubricalis*—*Epizeuxis*.

*Pseudorthosia variabilis* Grote.

*solidaginis*—*Cucullia*.

*Raphia cinderella* Smith.

*coloradensis* Put.

*pallula*—*coloradensis*.

*Rhizagrotis abnormis* (Smith).

*lagena* (Grote).

*Rhodosia julia*—*Timora*.

Rhynchagrotis (Triphæna).  
 Rhynchagrotis carissima (Harv.).  
     costata (Grote).  
     crenulata (Smith).  
     cupidissima (Grote).  
     exsertistigma (Morr.).

formalis (Grote).  
 inelegans (Smith).  
 lætula (Grote).  
 rufipectus (Morr.).  
 trigona Smith.  
 variata Grote.

Schinia 1852 arcigera. 1874 saturata: ground color of hind wings white. 1875 cupes: (77) saturata—front wings yellowish white. 1877 lanul: cupes—markings of front wings not reddish.

Schinia arctifera Guen.  
     buta Smith.  
     cupes (Grote).  
     intrabilis—Lygranthœcia.  
     lanul Str.  
     ligeæ—Thyreion.

ochreifuascia—lanul.  
 packardii—Lygranthœcia mortua  
 saturata (Grote).  
 velaris—lanul.

Scoliopteryx libatrix (Linn.)  
 Scopelosoma napæa—Litholomia.

Scotogramma 1776 trifolii. 1880 defessa: no distinct w-mark on st. line.

Former species feeds on Chenopodium and Atriplex.

Scotogramma defessa (Grote).  
     densa—Polia.  
     trifolii (Rot.)

macculosa Behr.  
 mexicana—Cirrhopolina.  
 nubicola Behr.  
 ochracea Behr.  
 perpallida—hastingsii.  
 socia Behr.  
 stretchii—howlandii.  
 tejonica Behr.

Segetia mersa—Perigea.  
 Setagrotis dernarius Smith.  
     infirmatis—Anomogyna.  
     radiatus—Lycophotia radiola.

Tæniocampa addenda—Monima.  
 arthrolita—Graphiphora.  
 carina—Polja insolens.  
 curtica—Eriopyge  
 furfurata—Eriopyge affurata.  
 pacifica—Monima.

Sidemia devastatrix Brace.  
 Simyra henrici (Grote).  
 Sprogueia fumata—Tarachidia.  
     vernalis—Anomogyna.  
 Stibadium fulignosa Stiria.  
     hutsoni—Stiria.

Tænicampi pavie—Trachea.  
 pectinata—Perigrapha.  
 perbrunea—Eriopyge.  
 præses—Perigrapha.  
 puerilis—Eriopyge.  
 pulchella—Perigrapha.  
 rufula—Eriopyge.  
 terminata—Perigrapha.

Stiria fulignosa (Smith).  
     hutsoni (Smith).  
 Stretchia addenda—Monima.  
     behrensiana—Xylomania.  
     erythrolita—Xylomania  
     inferior (Smith).  
     normalis—Perigrapha  
     mys—Monima.  
     plusiiformis (Colorado).  
     pulchella—Perigrapha.  
     transparens—Perigrapha.

Tamila vanella—Pseudotamila.  
 velaris—Schinia lanul.

Stylopoda cephalica Smith.  
 Symphistis kelloggi (Edw.).  
     propius Edw.

Tarache angustipennis—Conacontia.  
     acerba (Edw.).  
     areli (Stretch).  
     behrii (Smith).  
     candefacta—Tarachidia.  
     coquilletti (Smith).  
     elegantula—Conochares.  
     flavipennis (Grote).  
     gonella (Stretch).  
     lucasi (Smith).  
     niveicollis Smith.  
     semiopaca—Conochares elegant-

Synedoida biformata—Cissura.  
     scrupulosa—Cissura.  
     subtermina—Cissura.  
 Syneda adumbrata Behr.  
     divergens Behr.  
     edwardsii Behr.  
     hadeniformis—Melipotis jucun-  
     da.  
     hastingsii Edw.  
     howlandii Grote.

- ula.  
*Tarachidia candefacta* (Hubn.).  
     *fumata* (Smith).  
     *tortricina* (Zell.).  
*Tetanolita palligera* (Smith).  
*Thalpochara arizonæ*—*Conochares elegantula*.  
     *elegantula*—*Conochares*.  
     *daria*—*Eumestleta*.  
*Therasea angustipennis*—*Conacontia*.  
*Thyreion ligeæ* (Smith).  
*Timora julia* (Grote).  
*Tornacontia altera*—*Conochares*.  
*Tornacontia megocula*—*Græperia paviæ* (Behr.).  
*Trichoclea* 1887 *edwardsi*. 1871 *antica*: terminal band of hind wing no deep fuscous. U-scripta: am. line absent.  
*Trichoclea antica* Smith.  
     *edwardsii* Smith.  
     *postica* (Colorado).  
     *u-scripta* (Smith).  
*Tricholita fistula*—*Chabultat*.  
*Trichosellus cupes* Grote.  
*Trichotarche assimilis* Grote  
*Triocnemis saporis* Grote.  
*Triphæna carissima* (Harv.).  
     *costata* (Grote).  
     *crenulata* (Smith).  
*Ufeus* 1873 *plicata*. 1883 *sagitaria*: lines obsolete.  
*Ufeus plicatus* Grote.  
     *sagittarius* Grote.  
*Ulolonche niveiguttata*—*Hyssia*.  
*Veleria opina* Grote.  
*Xanthia bicoloraga*—*Amathes palæcea* Eesp.  
*Xanthothrix neumægeni* Edw.  
     *ranunculi* Edw.  
*Xylina amanda* Smith.  
     *carbonaria* (Harv.).  
     *contenta*—*Graptolitha*.  
     *dilatocula*—*Graptolitha*.  
     *indeterminata*—*Eurosis*.  
     *infructosa*—*Morrisonia confusa*.  
     *oregonensis*—*Graptolitha*.  
     *torrida* Smith.  
*Xylomania behrensiana* (Grote).  
*Xylomania* 1865 *simplex*. 1873 *curialis*: antennæ of male fasciculate; *patalis*: antennæ of male ciliated. 1874 *hiemalis*: (75) antennæ of male bipectinate. 1875 *behrensiana*: *hiemalis*—orbicular and reniform confluent. 1878 *rubrica*: (81) *simplex*—front wings with ground color brownish grey. 1881 *perlubens*: *rubrica*—front wings without black basal streak.  
*Xylophasia albina*—*Parastichtis antennata*—*Parastichtis*.  
*Trachea adnixa* (Grote).  
     *binotata* (Walk.).  
     *catalina* (Smith).  
     *centralis* (Smith).  
     *cinefacta* (Grote).  
     *divesta* (Grote).  
     *ethnica* (Smith).  
     *fumeola* Ham.  
     *genetrix* (Grote).  
     *indirecta* (Grote).  
     *marina* (Grote).  
     *mustelina* (Smith).  
     *pausis* (Smith).  
     *tusa* (Grote).  
     *cupidissima* Grote.  
     *discoidalis* (Grote).  
     *exsertistigma* (Morr.).  
     *erratica* (Smith).  
     *formalis* (Grote).  
     *inelegans* (Smith).  
     *lætula* (Grote).  
     *meta* (Smith).  
     *rufipectus* (Morr.).  
     *variata* (Grote).  
*Tristyla alboplagiata* Grote.  
     *curialis* (Grote).  
     *hiemalis* (Grote).  
     *patalis* (Grote).  
     *perlubens* (Grote).  
     *rubrica* (Harv.).  
     *simplex* (Walk.).  
*Xylomiges cruciles*—*Xylomania simplex*.  
     *curialis*—*Xylomania*.  
     *hiemalis*—*Xylomania*.  
     *ochracea*—*Lasionycta*.  
     *patalis*—*Xylomania*.  
     *perlubens*—*Xylomania*.  
     *rubrica*—*Xylomania*.  
     *simplex*—*Xylomania*.  
*Xylomæa didonea* (Smith).

cogitata—*Agroperina*.  
 cuculiformis—*Parastichtis*.  
 genialis—*Parastichtis*.  
 occidentis—*Parastichtis*.  
 pluviosa—*Parastichtis arctica*

*Yrias crudelis* Grote.  
*Zosteropoda hirtipes* Grote.  
*Zotheca tranquilla* Grote.  
 viridula—*tranquilla*.

#### NYCTEOLIDÆ.

A small family represented in California by a single species.  
*Nycteola revanyana* Scop.

#### PERICOPIDÆ.

A Mexican species extends into southern California.  
*Gnophaela hopfferi*—*latipennis*.  
*latipennis* Boisd.

#### DIOPTIDÆ.

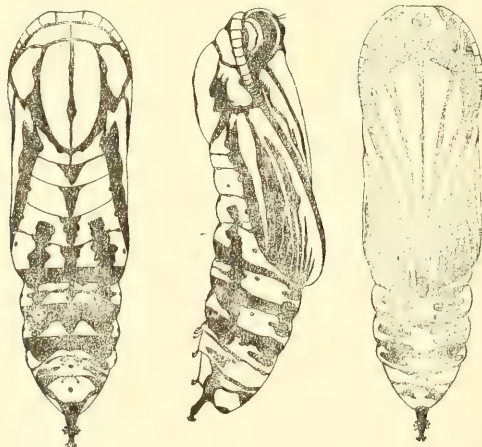


Figure 24. Pupa of the oak moth.

The oak moth is very troublesome in the bay region completely defoliating the live oaks every few years. It would not be very difficult to control by spraying with lead arsenate if the trees were smaller.  
*Phryganidia californica* Pack.

#### NOTODONTIDÆ.

Two moths of considerable importance belong to this family, *Datana ministra* which feed gregariously on walnut, and *Schizura concinna*, the red-humped caterpillar of the apple.

*Alastor gibbosa*—*Nadata*.  
*Cerura cinerea*—*Harpyia*.  
 cinereoides—*Harpyia*.  
 paradoxa—*Harpyia cinerea*.  
*Cocleopandra*—*Harpyia*.

*Clostera incarcerationata*—*Melalopha apicalis*.  
*Coelodasys conspecta*—*Schizura unicornis*.  
*Datana californica* Riley



- ministra Drury.  
 Diceranura scolopendrina—Harpyia.  
 Drymonia dimidiata—Pheosia.  
 Eumelia severa—Gluphisia.  
 Gluphisia albofascia wrightii.  
   crenata—septentrionalis.  
   septentrionalis Walk.  
   severa Edw.  
   wrightii Edw.  
 Harpyia cinerea (Walk.).  
   scolopendrina (Boisd.).  
 Hyperaeschra strangula (Grote).  
 Ichthypura apicalis—Melalopha.  
   bifaria—Melalopha.  
   brucei—Melalopha.  
   incarcerata—Melalopha apicalis.  
   inornata—Melalopha.  
   ornata—Melalopha apicalis.  
 Melalopha apicalis Walk.  
   alethe—brucei.  
   brucei Edw.  
   inornata Neum.  
   multonoma—brucei.  
 Melia danbyi—Gluphisia severa.  
 Phalaena concinna—Schizura.  
   gibbosa—Natdata.  
   unicornis—Schizura.  
 Pheosia californica—dimidiata.  
   dimidiata H. S.  
   portlandia Edw.  
 Schizura concinna S. & A.  
   conspecta—unicornis.  
   ipomoeæ Doub.  
   unicornis S. & A.  
 Nadata behrensii—gibbosa.  
   gibbosa (S. & A.).  
   oregonensis—gibbosa.  
 Notodonta californica—Pheosia dimidiata.  
   pacificæ—Hyperaeschra strangula.  
   strangula—Hyperaeschra.  
 Oedemasia salacis—Schizura concinna.  
   unicornis—Schizura.

## THYATIRIDÆ.

- Bombycia improvisa Edw.  
 Gluphisia tearlei—Bombycia improvisa  
   tearlei—improvisa.

## LIPARIDÆ.

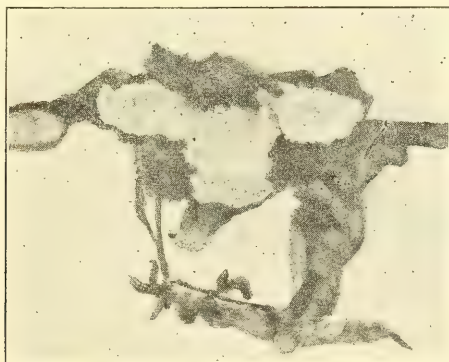


Figure 25. Cocoons of tussock moth with egg masses.

This family is represented here by a single species.

The tussock moth of this coast resembles the eastern species quite closely but is very much more resistant to arsenicals requiring very heavy doses, or the use of some of the other methods described in Cal. Bulletin 183.

*Hemerocampa vetusta* Boisd.

*Orgyia canæ*—*Hemerocampa vetusta*.

*gulosa*—*Hemerocampa vetusta*.

*vetusta*—*Hemerocampa*.



Figure 26. Dust mound about a tree to protect it from tussock moth larvæ after shaking them down.

#### LASIOCAMPIDÆ.

This Family includes three species of tent caterpillars *Malacosoma* which are at times highly injurious in orchards.

*Clisiocampa americana*—*Epicnaptera*.

*californica*—*Malacosoma*.

*constricta*—*Malacosoma fragilis*.

*disstria*—*Malacosoma*.

*drupacearum*—*Malacosoma disstria*.

*Epicnaptera americana* Harris.  
     *erosa*—*Malacosoma. disstria*.  
     *fragilis*—*Malacosoma*.  
     *thoracica*—*Malacosoma*.  
     *Pseudoneustria*—*Malacosoma*  
     *californica*—*americana*.  
     *frutetorum* (not California).  
*Gastropacha americana*—*Epicnaptera*.

*Lasiocampa carpinifolia*—*Epicnaptera*  
     *americana*.  
*Malacosma ambismilis*—*californica*.  
     *californica* Pack.  
     *constricta*—*fragilis*.  
     *disstria* Hubn.  
     *fragilis* Stretch.

## BOMBYCIDÆ.

The silk worm of commerce is found in this state only under domestication.  
 See California circular 12.  
*Bombyx mori* Linn.



Figure 27. Tussock moth larva.

## PLATYPTERYGIDÆ.

*Drepana arcuata* Walk.

*siculifer* Pack.

## GEOMETRIDÆ.

The larvæ of the moths of this family have but ten legs, and walk with a peculiar looping motion and are called loopers, span worms or measuring worms. This peculiarity is also indicated by the name Geometridæ. The canker worms *Alsophila* and *Paleacrita* are the most injurious members of the family.

*rubromarginaria*—*Xystrota*  
     *paticaria*.  
     *sideraria*—*Eois*.  
     *subalbaria*—*Eois anticaria*.  
*Æthalodes packardia* (Hulst.)  
*Æthyctera electa* Hulst.  
*Alcis californiaria*—*imitata*.  
     *dejecta* Hulst.  
     *sulphuraria* Pack.

*he- Alsophila pometaria* Harr.  
     *Anagoga pulveraria* Linn.  
     *Anaploides arizonaria* Grote.  
         *delicaria* Dyar.  
*Acidalia ancillata*—*Cinglis*.  
     *californiaria*—*Eois sideraria*.  
     *dataria*—*Cosymbia*.  
     *granitaria*—*Eois*.

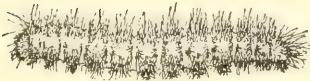
magnetoria—*Leptomeris*.  
 depromaria Grote  
 imitata Walk.  
 latifasciaria (Pack.).  
 metanemaria Hulst.  
 obliquaria Grote.  
 pacificaria—*Eois sideraria*.  
 5-linearia—*Letomeris*.  
 rubrolinearia—*Leptomeris magnataria*.  
 festaria—arizonaria.  
 illustraria Hulst.  
 iridaria Guen.  
 pistacearia Pack.  
*Ania brehmeata* Gros.  
*Anisopteryx pomataria*—*Alsophila*.



A



B



C

Figure 28. The three most caterpillar pests attacking the foliage of the apple  
 A. Canker worm. B. Tussock moth. C. tent caterpillar.

venata—*Paleacrita*.  
*Annemoria faseolaria* (Guen.).  
 graefiaria Hulst.  
*Apæcasia mercedulata* Strech.  
*Aplodes rubrifrontaria* Pack.  
*Aspilates opuscularia*—*Pterospoda*.  
 behrensaria—*Deilinia*.  
 desperaria Hulst.  
 dissimilaria Hubn.  
*Azelina ancetaria* Hubn.  
 behrensata Pack.  
 occidentalis Hulst.  
 hubneraria—ancetaria.  
*Baptria californiata*—*Euchoeca*.  
*Biston virginarius*—*Lycia*.  
*Boarmia californica*—*Alcis imitata*.  
 clivinoria—*Selidosema clivinar-*

ium.  
 plumogeraria Hulst.  
 wrightiaria Hulst.  
*Brephos californicus* Boisd.  
 melanis Boisd.  
*Caberodes confusaria* Hubn.  
*Camptogramma fluviata*—*Percnoptilota*.  
*Caripeta æqualiaria* Grote.  
*Catopyrra ferruginosaria* (Pack.).  
*Cherodes ægrotata*—*Sabuloides caberata*.  
 nubiliata—*Sabluoides*.  
*Chesiadodes morosata* Hulst.  
*Chesias occidentaliata*—(synonymy undetermined).  
*Chlorochlamys chloroleucaria* Guen.  
 phyllinaria Zell.  
*Chlorochlystis inconspicua* Hulst.  
*Chlorosea fasciolaria*—*Annemoria nevadaria* Pack.  
 perviridaria—*Annemoria faseolaria*.  
*Choerades nubiliata*—*Sabuloides*.  
*Cidaria glaucata*—*Hydriomena sordidata*.  
 leoninata—*Eurhinosea*.  
 mancipata—*Eurhinosea*.  
 multilineata—*Mesoleuca impliata*.  
 nubilata—*Sabuloides*.  
 4-punctata—*Cœnocalpe magnoliata*.  
 rubrosuffusata—*Rheumaptera*.  
 subochreatea—*Eurhinosea mancipata*.  
*Cinglis ancillata* Hulst.  
*Cleora atrofasciata*—*Siagraphia continuata*.  
 caberata—*Sabuloides*.  
 correllatum Hulst.  
 formosata Hulst.  
 punctomaculata—*Philedia*.  
*Cœnocalpe annellata* Hulst.  
 carnata Pack.  
 cœnonymphata Hulst.  
 magnoliata Guen.  
 oxygramma Hulst.  
 phlebeculata (Guen.).  
 polygrammata Hulst.  
*Cœnocharis interruptaria* Grote.  
*Coniodes plumigeraria* Hulst.  
*Coremia californiata*—*Petrophora mutitata*.  
 convallaria—*Petrophora*.



- defensaria*—*Petrophora*.  
*pulebeculata*—*Cænocalpe*.  
*perpugnata*—*Gypsochroa* *designata*  
*Corphista badiaria* Edw.  
*meadii* Pack.  
*Cosymbia dataria* (Hulst).  
*Cymatophora benigna* Hulst.  
*bicolorata* Fabr.  
*bitactata* Walk.  
*californiaria*—*Platea*.  
*guenearia* Pack.  
*inquinaria* Hulst.  
*occiduaria* Pack.  
*subcessaria* Walk.  
*umbriferata* Hulst.  
*Dasyfidonia avuncularia* Pack.
- Enchoria albifasciata* Pack.  
*osculata* Hulst.  
*Enemera juturnaria* Guen.  
*Enypia venata* Grote.  
*Eois anticaria* Walk.  
*granitaria* Pack.  
*lævitaria* Hubn.  
*lanceolata* Hulst.  
*microphysa* Hulst.  
*occidentata*—*Leptomeris* *occidentaria*.  
*sideraria* Guen.  
*Epirrita* 12 *lineata*—*Venusia*.  
*Ersephila grandipennis* Hulst.  
*Eubolia custodiata*—*Hydriomena*.  
*Eucestia rotundata* (Pack.).  
*fuscata* Gro.

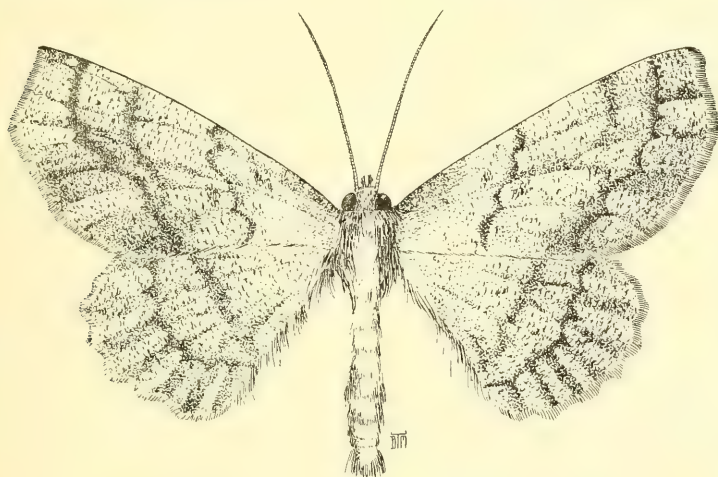


Figure 29. A Geometrid moth.

- Deilinia behrensaria* Hulst.  
*carnearia* Hulst.  
*falcataria* Pack.  
*fœminaria* Guen.  
*fumosa* Hulst.  
*indurata* Dyar.  
*litaria* Hulst.  
*nevadaria* Hulst.  
*nigroseriata* (Pack.)  
*perpallidaria* Grote.  
*quadraria* Grote.  
*Ectropis crepuscularia*, D. & G.  
*Ellopiæ californiaria*—*Platea*.  
*placeraria*—*Pherne*.
- Euchæna argillaria* (Hulst.).  
*falcata* (Pack.).  
*johnsonaria* Fitch.  
*Euchœca californiata* Pack.  
*cretacea* Pack.  
*Eucrostis viridipennata* Hulst.  
*Eucymatogogne intestinata* Guen.  
*Eupithecia behrensata*—*Azelina*.  
*cretacea*—*Euchœca*.  
*longipalpata*—*Mycteropoda*.  
*nevadata*—*Tephrodistis*.  
*rotundopuncta*—*Tephrodistis*.  
*subapicata*—*Tephrodistis*.  
*Eurhinosea flavaria* (Pack.).

leoninata (Pack.).  
 mancipata (Guen.).  
 Eustroma nubilata Pack.  
 Eutrapela anafracta—Sabuloides.  
 falcata—Euchlæna.  
 nubilata—Sabuloides.  
 Fidonia avuncularia—Dasyfidonia.  
 Geometra illustraria—Anaploides.  
 iridaria—Anaploides.  
 iridaria—Anaploides illustraria.  
 rectaria—Anaploides iridaria.  
 Glaucina incorpriata Hulst.  
 epiphysaria Dyar.

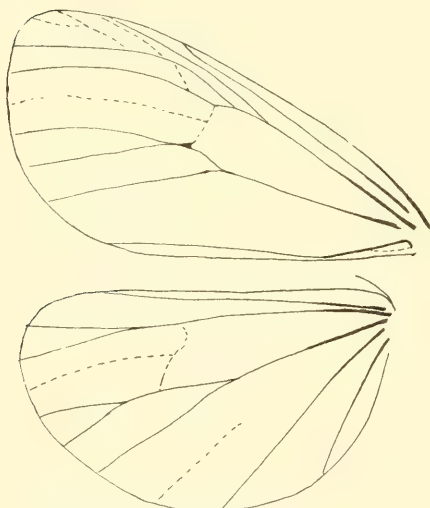


Figure 30. Diagram of the venation of the higher moths.

Glaucopteryx cretacea—Euchæca.  
 implicata—Mesoleuca.  
 magnoliata—Cœnocaple.  
 Gonodontis formosa Hulst.  
 Gorytodes uncanaria—Platea californi-  
 aria.  
 Gymnocelis inferior Hulst.  
 minuta Hulst.  
 Gypsochroa designata Hubn.  
 sitellata Guen.  
 Halia cineraria—Symphreta marces-  
 saria.  
 4-linearia—Cymatophora bitac-  
 tata.  
 marcessaria—Symphreta.

tripunctaria—Symphreta.  
 Hemerophila latifasciaria—Alcis.  
 packardaria—Aethalodes.  
 Hesperumia ochresata—Alcis sulphur-  
 aria.  
 Heterolocha edwardsata—Neoterpes.  
 Heterophleps triguttaria Her.  
 Hydria undulata Linn  
 Hydriomena amorata Hulst.  
 autumnalis Strom.  
 banavahrata Strech.  
 californiata Pack.  
 Holochroa dissociaaria Hulst.  
 indistincta Hulst.  
 costiguttata Hulst.  
 custodiata (Guen.).  
 herbicolata Hulst.  
 indefinata Gros.  
 latirupta Walk.  
 neomexicana Hulst.  
 packardata Gros.  
 5-fasciata—sordidata.  
 sordidata Fabr.  
 sparimacula Hulst.  
 speciosata (Pack.).  
 tæniata Steph.  
 Hyperitis notataria Hulst.  
 trianguliferata Pack.  
 Hysepates californiata—Hydriomena.  
 5-fasciata—Hydriomena sordida-  
 ta.  
 speciosata—Hydriomena.  
 viridata—Hydriomena sordidata.  
 Hyria occidentaria—Leptomeris.  
 Larentia cumatilis—Cœnocalpe mag-  
 noliata.  
 implicata—Mesoleuca.  
 12-lineata—Venusia.  
 Leptomeris magnetaria Guenee.  
 occidentaria (Pack.).  
 quinquelenearia Pack.  
 Lithostege rotundata—Eucestia.  
 Lozogramma fæminaria—Delinia.  
 juturnaria—Enemera.  
 nigroshaata—Delinia.  
 sabularia Guen.  
 s-signata Pack.  
 Lycia virginaria (Grote).  
 Cacaria californiaria—Siagraphia.  
 Marmarea occidentalis Hulst.  
 Marmopteryx marmorata Pack.  
 Melanophia canandaria (Guen.).  
 Mesoleuca californiata—Hydriomena.  
 packardata.  
 etneta Hulst.

- implicata* (Guen.).  
*truncata* Hubn.  
*vasaliata* Guen.  
*Metanema argillaria*—*Euchæna*.  
*aurantiacaria*—*Sabuloides*.  
*cervinaria*—*Sabuloides*.  
*forficularia*—*Sabuloides caber-*  
*ata*.  
*forficularia*—Guen.  
*inatomaria* Guen.  
*subpunctata* Hulst.  
*Metrocampa prægrandaria* Guen.  
*viridoperlata*—*prægrandaria*.  
*Nyctophora longipalpata* Hulst.  
*Nenoria faseolaria*—*Annemoria*.  
*monticola* Hulst.  
*Neoterpes edwardsata* (Pack.).  
*Nomenia unipicta* Pear.  
*Nepytia nigrovenaria* Pack.  
*umbrosata* Pack.  
*Numeria californica* (undetermined.)  
*determined*).  
*Nycterosea brunneipennis* Hulst.  
*Nyctobia nigroangulata* Str.  
*Ochyria abrasaria*—*Petrophora*.  
*carneata*—*Cœnocalpe carnata*.  
*gueneata*—*Hydriomena custodia-*  
*ta*.  
*lacteata*—*Trichochlamys*.  
*lignicolorata*—*Zenopheps*.  
*munitaria*—*Petrophora*.  
*rubrosuffusata*—*Rheumaplero*.  
*Odezia californiata*—*Euchœca*.  
*Opæcasia mercedulata* Str.  
*Orthofidonia elsinora* Hulst.  
*Paleacrita longiciliata* Hulst.  
*vernata* (Pack.).  
*Panagra flavofasciata*—*Siagraphica*  
*neptaria*.  
*subminiata*—*Siagraphica*.  
*Pernoptilota fluviata* (Hubn.).  
*Petrophora abrasaria* H. S.  
*convallaria* Guen.  
*defensaria* Guer.  
*flavata*—*Eurhinosea flavaria*.  
*leoninata*—*Eurhinosea*.  
*mancipata*—*Eurhinosea*.  
*munitata* Hubn.  
*nemorella* Hulst.  
*prunata*—*Eustromo nubiliata*.  
*truncata*—*Mesoleuca*.  
*Phasiana irrorata*—*Siagraphia*.  
*neptata*—*Siagraphia neptaria*.  
*subminiata*—*Siagraphia*.  
*Phengommataea edwardsata* Hulst.  
*spoliata* Gro.  
*Pterospoda perumbaria*.  
*Pierotæa cariosa* Hulst.  
*Procherodes catenulata*—*Sabuloides*.  
*Racheia latipennis* Hulst.  
*Rheumaptera basaliata*—*Hydriomena*  
*tæniata*.  
*brunnercellata*—*Mesoleuca gra-*  
*tulata*.  
*delimiata* War.  
*georgii* (Hulst.).  
*rubrosuffusata* (Pack.).  
*Sabulodes anfractata* Hulst.  
*aurantiacaria* Pack.  
*caberata* (Guen.).  
*catenulata* Grote.  
*cervinaria* (Pack.).  
*nubilata* (Guen.).  
*truxaliata* (Guen.).  
*Scelidacantha virginata* Graef).  
*Sciagraphia californiaria* Pack.  
*continuata* Walk.  
*denticulata* Grote.  
*granitata* Guen.  
*irrorata* Guen.  
*muscaria* Guen.  
*neptaria* Guen.  
*sinuata* Pack.  
*spondoplerata* Hulst.  
*subminata* (Pack.).  
*Scotosia californiata*—*Philereme*.  
*hæsitata*—*Triphosa dubitata*.  
*Seidosema ætholodaria* Dyar.  
*californiata*—*Enemera juturnaria*.  
*tnnaria*.  
*clivinarium* Guen.  
*correctatum* Hulst.  
*delicatum* Hulst.  
*humarium* Guen.  
*lachrymosum* Hulst.  
*laminarium* Steck  
*wrightiarum* Hulst.  
*Semiothisa denticulata*—*Siagraphia*.  
*inquinnaria*—*Cymatophora*.  
*umbrikerata*—*Cymatophora*.  
*Sicya crocerariamacularia*  
*macularia* Harr.  
*Sigela penumbra* Hulst.  
*Slossonia rubrotincta* Hulst.  
*stenocapilates* Dyar.  
*smithii* Gro.  
*Sympherta marcessaria* Guen.  
*tripunctaria* Pack.  
*Synazys oblentaria* Grote.  
*Synchlora denticulata* Walk.  
*gratulata* Walk.

- hersiliata Guen.  
 Pherne parallelia Pack.  
   placearia Guen.  
 Philedia punctomaculata Hulst.  
 Philereia californiata Pack.  
 Philobia enotata Guen.  
 Philopsia nivigerata Walk.  
 Philtæa elegantaria Edw.  
 Platea californiaria Her.  
   diva Hulst.  
 Pleymria fulviata—Percnoptilota.  
   georgii—Rheumaptera.  
 Pteropoda opuscularia Hulst.  
   liquoraria Guen.  
 Synglochis perumbraria Hulst.  
 Tephina haliata—Sciagraphia granita.  
   lorquinaria—Sympherta tripunc-  
   taria.  
   monicaria—Deilinia fœminaria.  
   muscariata—Sciagraphia.  
   neptaria—Sciagraphia.  
   sabularia—Marscaria.  
   unicobraria—Alcis sulphuraria.  
 Tephroclystis acutipennis Hulst.  
   annulata Hulst.  
   behrensata Pack.  
   bivittata Hulst.  
   brunneipennis Hulst.  
   californiata—miserulata.  
   cestata Hulst.  
   cretata Hulst.  
   implorata Hulst.  
   laisata Streck.  
   longipalpata Pack.  
   miserulata Grote.  
   misturata Hulst.  
   nevadata Pack.  
   nimbicolor Hulst.  
   nimbosea Hulst.  
   obscurior Hulst.  
   ornata Hulst.  
   raveocostaliata Pack.  
   rotundopuncta Pack.  
   subapicata Guen.  
   unicolor Hulst.  
 Tephrosia californiaria—(Synonymy  
   undetermined).  
   canadaria—Melanolophia.  
   carnearia—Deilinia.  
   celataria—Deilinia fœminaria.  
   falcatria—Deilinia.  
   fautaria—Thalophaga.  
   ferruginosaria—Catopyrrha.  
   nevadaria—Deilinia.  
   nigrosariata—Deilinia.  
 Tetracis ægrotata—Sabuloides caber-  
   ata.  
   aurentiaria—Sabuloides.  
   cervinaria—Sabuloides.  
   edwardsiata—Neoterpes.  
   mellitularia—Pherne placearia.  
   parallelia—Pherne.  
   trianguliferata—Hyperitis.  
   truxaliata—Sabuloides.  
 Thalophaga fautaria Hulst.  
 Thamnionoma guenearia—Cymatophora  
   mercessaria—Sympherta.  
   4-linearia—Cymatophora bitacta-  
   ta.  
   3-punctaria—Sympherta.  
 Trichochlamys lacteata (Pack.).  
 Triphosa badiaria Edw.  
   dubitata Pack.  
   pustularia Edw.  
 Venusia cambrica Curt.  
   duodecemlineata (Pack.).  
   virginata—Scelidacantha.  
 Xanthrohæ nemoralis Hulst.  
 Xystrota hepaticaria Guen.  
 Zenophleps lignicolorata (Pack.).  
   obscurata Hulst.

## TINEINA.

A family of small moths found on the trunks of trees, the larvæ feeding on lichens.

## NOLIDÆ.

- Celama anfracta Edw.  
   aphyla Hamp.  
   minna Bull.  
 Nola apæra Druce.  
   hyemalis—Celama minna.  
   minuscule—Roseelia.  
 Roseelia minuscule Zell.



## PSYCHIDÆ.

The basket worms or bag worms belong to this family. None of the species are common in California.

*Chalia fragmentella* Edw.  
*Hyaloscotes fumosa* Butl.

*Oiketicus davidsoni* Edw.  
*Thyridopteryx meadii* Edw.

## THYRIDÆ

*Belnoptera fratercula* Pag.  
*vitrina* Boisd.

*Dysodia oculatana* Clem.  
*Hexeris enhydris* Grote.

## COSSIDÆ.

The Cossidæ have wood boring larvæ. Cossus is quite common on cottonwoods and poplars, and *Prionoxystus* on locust trees. The pupal skins of these insects are conspicuous objects on the trunks of these trees.

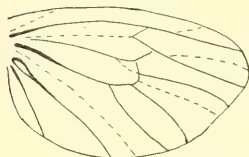
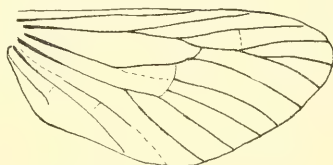


Figure 31. Venation of Cossidæ and related moths in which the independent vein crosses the cell. Dotted lines are veins not uniformly present.

*Cossus populi* Walk.  
*Hypopta bertholdi* Grote.  
*riversii* Stretch.  
*Prionoxystus robinæ* (Peck.).  
*Xyleutes robinæ*—*Prionoxystus*.

## SESIIDÆ.

Day flying moths with partly transparent wings making them resemble wasps. The larvæ bore into plants. The most injurious species is the peach tree borer, *Sanninoidea*. Our species is very similar to the equally troublesome eastern *S. exitiosa*.

The food plants of the other species are:— **Pines** and **Redwood** *Vespamia*, **Poplars** *Ægeria* and *Memythrus*, **Locust** *Memythrus*, **Willows** *Ægeria*, and *Sesia albicornis*, **Sumac** *Melitta*, **Galls on Mesquit** *Sessia prosopis*, **Currants** and **Gooseberries** *Sesia tipuliformis* and **Strawberries** *Sesia rutilans*.

## SYNOPSIS OF GENERA.

*Sesia*. *Ægeria* and *Paranthene*: tongue rudimentary, the latter with tibiae tufted. *Albuna* and *Memythrus*: hind independent from middle of cross-vein, the latter with palpi long haired. *Sanninoidea*: abdominal tufts of male not fan-like, female abdomen with lateral tufts.

*Ægeria hemizonæ*—*Sesia*.  
*impropria*—*Sesia*.

*lupini*—*Sesia*.  
*mandariæ*—*Sesia rutilans*.

noveborasensis—*Sesia*.  
 pacifica Edw.  
*Albuna artemisiæ*—*Sesia mellinipennis*.

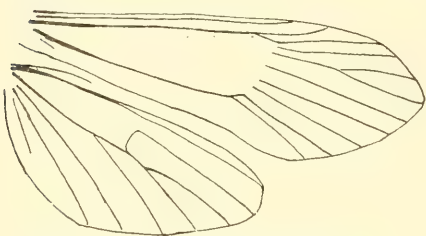


Figure 32. Diagram of the venation of *Sesiidæ*.

*Pyrotœnia achillæ*—*Sesia*.  
 behrensii—*Sesia*.  
 polygona—*Sesia*.  
*Sanninoidea opalescens* Edw.  
*Sesia achillæ* (Edw.).  
 albicornis Edw.  
 behrensii (Edw.)  
 elda—behrensii.  
 eremocarpi—achillæ.  
 fragariæ Edw.  
 helianthi—behrensii.  
 orthocarpi—fragariæ.  
 mellinipennis Boisd.  
 neglecta Edw.  
 novarœnsis (Edw.).  
 pictipes G. & R.  
 polygona (Edw.).

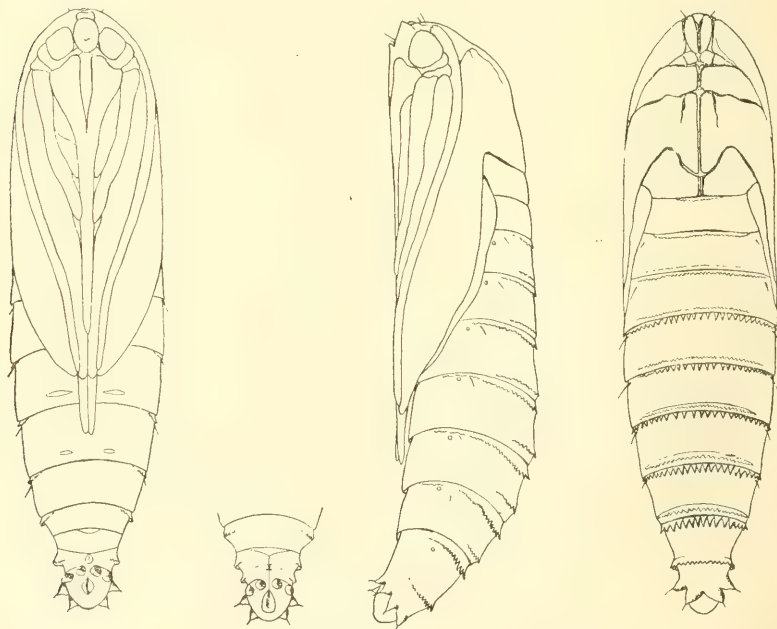


Figure 33. Pupa of the peach tree borer.

pyramidalis Walk.  
 resplendens—*Sesia mellinipennis*  
*Melittia glorioa* Edw.  
 satyriniformis Hubn.  
*Memphyrus robinæ* Edw.  
*Paranthrene heucheræ* (Edw.).

rileyana Edw.  
 rutilans Edw.  
 tipuliformis Clerck.  
*Trochilium pacificum*—*Aegeria*.  
*Zenodoxus heucheræ*—*Paranthrene*.  
*Vespa mima sequoiæ* Edw.

## PYRALIDÆ.

This family includes the mediterranean flour moth *Ephestia kuehniella*, its near relative *E. cautella* a pest in this state on raisins, the indian meal moth *Plodia interpunctella* and the meal snout moth, *Pyralis farinalis*.

The bee moth, *Galleria*, also belongs here, and likewise the root web worms, *Crambus*, and a whole series of leaf folders and crumplers, including the grape leaf roller, *Desmia*.

*Achroa grisella* Fabr.

*Bandera subluteella* Rag.



Figure 34. Work of larvæ of peach tree borer.

*Ædis funalis*—**Evergrestis**.

*Acrobasis alatella*—**Myeolis**.

*tricolorella*—**Mineola**.

*Aglossa cuprealis* Hueb.

*Ambesa walsinghami* Rag.

*mirabile* Dyar.

*Annaphila immerens*—**Titanio**.

*Anerastia excantalis*—**Megaspis**.

*Anoristia olivella* Hulst.

*Aphomia sociella* Linn.

*Argyria auratella* (Clem.)

*Attacapa callipeplella* Hulst.

*Autocosmia nexalis* Hulst.

*Botis annaphilalis*—**Loxostege**.

*commortalis*—**Pyrausta**.

*dapalis*—**Titanio**.

*fodinalis*—**Pyrausta**.

*fumoferalis*—**Pyrausta**.

*lethalis*—**Pyrausta**.

*levalis*—**Pilocris inguinalis**.

*lulualis*—**Loxostege anartalis**.

*monulalis*—**Pyrausta mustelinalis**.

*mustelinalis*—**Pyrausta**.

*obnigralis*—**Pyrausta unifascialis**.

*nasonialis*—**Loxostege**.

nexalis—*Autocosmia*.  
 octosignatus—*Pyrausta*.  
 offumalis—*Loxostege*.  
 perrubralis—*Pyrausta*.  
 profundalis—*Pyrausta*.  
 semirubralis—*Pyrausta*.  
 thrallophilalis—*Loxostege*.  
 unifascialis—*Pyrausta*.  
 uxoreulalis—*Pyrausta nicalis*.  
 vacunalis—*Pyrausta*.  
*Calamochrous straminea* War.  
*Cayuga bistriatella*—*gemmatella*.  
     *gemmatella* (Hulst.)  
*Chalcœla gemmalis* Hulst.  
*Chilo leachellus*—*Crambus*.  
*Cœnochroa californiella* Rag.

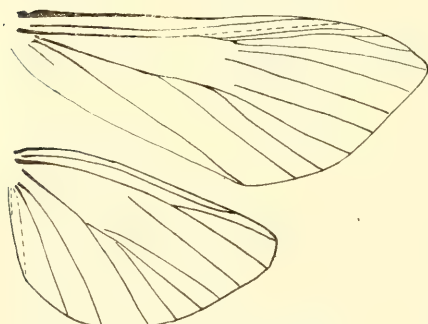


Figure 35. Venation of Pyralidæ.

*Crambus albilineellus* Fern.  
     *anceps* Grote.  
     *attenuatus* Grote.  
     *auratellus*—*Argyria*.  
     *behrensellus*—*biothanatilis*.  
     *biothanatilis* Hulst.  
     *causapilis* Hulst.  
     *hastiferellus* Walk.  
     *hortuellus* (Hueb.)  
     *leachellus* (Zin.)  
     *luteolellus* Clem.  
     *occidentalis* Grote.  
     *pascuellus* (Linn.)  
     *perlellus* (Scop.)  
     *pusionellus* Zell.  
     *toparius*—*hortuellus*.  
     *ulæ*—*luteolellus*.  
     *undatus* Grote.  
     *unistriatellus* Pack.  
     *vulgivagellus* Clem.  
*Cybalomia extorris* Led.

*Dakrura coccidivora*—*Lætilia*.  
*Dasypyga alternosquamella* Rag.  
*Desmia funeralis* Hueb.  
*Diaphania hyalinata* Linn.  
*Diasemia elegans* War.  
*Diastictis cæcalis* War.  
*Dicymolomyia metalliferalis* Pack.  
     *opuntiellus* Dyar.  
*Dioryctria californialis* Walk.  
*Dolichorhinia aureofasciella* Rag.  
*Eccopsis serratilineella* Rag.  
*Elasmopalpus decoralis* Walk.  
*Emprepes nuchalis*—*Noctuella*.  
*Ephestia albocostalis*—*Epischnia*.  
     *cautella* Walk  
     *kuehniella* Zell.  
     *nigrella* Hulst.  
     *opalescella* Hulst.  
*Ephestoides erythrella* Rag.  
     *gilvescentella* Rag.  
     *nigrella* Hulst.  
*Epischnia albocostalis* (Hulst.)  
     *boisduvaliella* Guen.  
     *fulvirugella* Rag.  
     *granitella* Rag.  
     *ruderella* Rag.  
*Etiella schisticolor* Zell.  
     *zinckenella* (Treit.)  
*Euchromius ocella*—*Ommatopteryx*.  
*Eurycreon anartalis*—*Loxostege*.  
*Eurythmia coloradella* Hulst.  
*Eustixia octonalis* Zell.  
*Euzophera semifuneralis* (Hulst.)  
*Evergestis funalis* Grote.  
     *napæalis* Hulst.  
     *rimosalis* Guen.  
     *straminalis* Hueb.  
*Galleria mellonella* Linn.  
*Glyptoteles rhyphodella*—*Nephopteryx*.  
*Herculia olinalis* Guen.  
*Homœosoma albiscutellum* Rag.  
     *impressale* Hulst.  
     *mucidellum* Rag.  
     *opalescellum* Hulst.  
*Honora canacostella*—*montinatatella*.  
     *mellinella* Grote.  
     *montinatatella* Hulst.  
     *oblitella* Clem.  
     *ochrimaculella*—*mellinella*.  
     *scinrella* Rag.  
     *undulatella*—*oblitella*.  
*Hornigia lugubrella*—*Moodna*.  
*Lætilia coccidivora* (Coms.)  
*Lineodes integra* Zell.  
*Liopasia ternalis* Led.



*Lipographis fenestrella* (Pack.)  
*humilis* Rag.  
*leoninella*—*fenestrella*.  
*Loxostege anartalis* Grote.  
*annaphilalis* Grote.  
*chortalis* Grote.  
*flavalis* Fern.  
*fiavifimbrialis* War.  
*linealis* Fern.  
*napæalis*—*Evergestis*.  
*nasonialis* Zell.  
*oberthuralis* Fern.

*quadristrigalis* Fern.  
*morenalis* Dyar.  
*Mineola calignella* (Hulst.)  
*tricolorella* (Grote.)  
*Monocona rubralis* War.  
*Moodna lugubrella* Rog.  
*Myelois alatella* (Huist.)  
*corniella* (Grote.)  
*grossipunctella* Rag.  
*Nephopteryx caliginella*—*Mineola*. . .  
*crassifasciella* Rag.  
*fasciolaris* (Hulst.)



Figure 36. The grape leaf roller.

*offumalis* Hulst.  
*similalis* Guen.  
*sticticallis* Linn.  
*thallophilalis* Hulst.  
*triumphalis* Grote.  
*Lygropia rivulalis* Ham.  
*Manhatta lugubrella*—*Moodna*.  
*Megaphysis edwardsialis*—*Megasis*.  
*Megasis cinctella* Hulst.  
*edwardsialis* (Hulst.)  
*excantalis* (Hulst.)  
*Metasia argalis* Fern.

*fenestrella*—*Lipographa*.  
*geminipunctella*—*ovalis*.  
*leoninella*—*Lipographis fenestrel-*  
*la*.  
*oblitella*—*Honora*.  
*ovalis* (Pack.)  
*perfuscalis*—*Sarata*.  
*rhypodella* (Hulst.)  
*scintillans*—*Pyla*.  
*semifuneralis*—*Euzophera*.  
*subtinctella* Rag.  
*undulatella*—*Honora oblitella*.

- Noctuella nuchalis* Grote.  
*simplex* War.  
*Nomophila noctuella* D. & S.  
*Ommatopteryx ocella* (Haw.)  
*Omphalocera dentosa* Grote.  
*Orobæna octonalis*—*Eustrixia*.  
*Ortholepsis jugosella* Rag.  
*Pachyzancla periusalis* Walk.  
*Palparia ocella*—*Ommatopteryx*.  
*Parædis napælis* Hulst.  
*Passadena constantella* Hulst.  
*Pempelia albipennella*—*Staudingeria*.  
*fenestrella*—*Lipographis*.  
*leoninella*—*Lipographis fenestrel-*  
*ovalis*—*Nephopteryx*.  
*coccinea* War.  
*commortalis* Grote.  
*fodinalis* Led.  
*fumoferalis* Hulst.  
*gracilalis* Hulst.  
*laticlavata* G. & R.  
*lethalis* Grote.  
*mustelinalis* Pack.  
*nicalis* Grote.  
*octosignalis* Hulst.  
*perrubralis* Pack.  
*rubricalis* Hueb.  
*semirubralis* Pack.  
*subnicalis* War.  
*unifascialis* Pack.

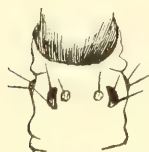
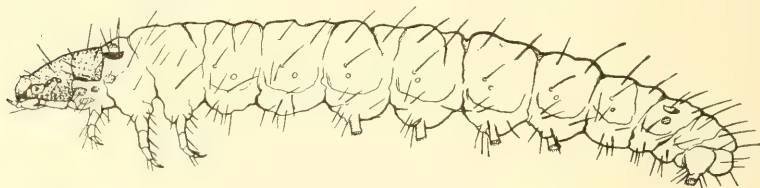


Figure 37. Larva of the grape leaf roller.

- Peoria albidella* Hulst.  
*Phalena pascuellus*—*Crambus*.  
*perlellus*—*Crambus*.  
*Phlyctænia externalis* War.  
*ferrugalis* Hueb.  
*indistinctalis* War.  
*profundalis* Pack.  
*Phorasea similis* Grote.  
*Phycis zinckenella*—*Etiella*.  
*Pilocrocis inguinalis* Guen.  
*Pinipestris fasciolalis*—*Nephopteryx*.  
*Plodia interpunctella* Hueb.  
*Pseudoschœnobius opalescalis* (Hulst.)  
*Pyla bistratella* Hulst.  
*scintillans* (Grote.)  
*Pyralis farinalis* Linn.  
*Pyrausta angustalis* Grote.  
*vacunalis* Grote.  
*versicolor* War.  
*Ragonotia dotalis* Hulst.  
*Salebria ochripunctella* Dyar.  
*Saluria ardifera* Hulst.  
*dichrocella* Rag.  
*rostellata* Rag.  
*Sarata perfuscalis* (Hulst.)  
*umbrella* Dyar.  
*Schœnobius opalescalis*—*Pseudoschœ-*  
*nobius*.  
*Scoparia atropicta* Ham.  
*Selagia olivella*—*Anorista*.  
*centuriella* D. & S.  
*rectilinea* Zell.  
*refugalis*—*rectilinea* Zell.  
*Spermatophthora gemmatella*—*Cayuga*.

- Staudingeria albipenella* (Hulst.)  
*Stemmatophthora nicalis*—*Pyrausta*.  
*Stenophyes huronalis* Guen.  
*Stericta trabalis*—*Yuma*.  
*Symphysa eripalis* Grote.  
*Thaumatopsis coloradella* Kear.  
*Tinea hortuellus*—*Crambus*.  
*Titanio dapalis* Grote.  
     *immerens* (Hav.)  
     *nuchalis*—*Noctuella*.  
     *proximalis* Fern.  
*Unadilla erronella* Zell.  
*Urulla incongruella* Hulst.  
*Valdivia mirabellicanella* Dyar.  
*Vitula serratilineella*—*Eccopsia*.  
*Yuma adulatalis*—*trabalis*.  
*Xanthippe descansales* Dyar.  
     *trabalis* Grote.  
*Zophodia fuscata* Hulst.  
     *packardella* Rag.

## PTEROPHORIDÆ.

This and the following family are called plume moths because of the very remarkable splitting of the wings shown in the accompanying figure.

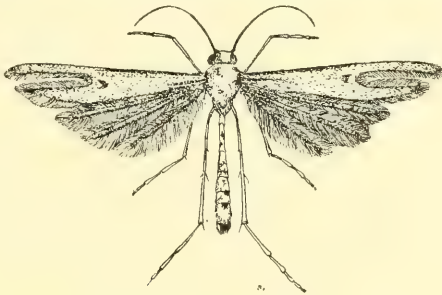


Figure 38. A plume moth.

- Aciptalis cinerascens*—*Alucita*.  
     *montanus*—*Alucita*.  
*Alucita cinerascens* (Wals).  
     *cosmodactyla*—*Platyptilia*.  
     *montana* (Wals.)  
*Amblyptilus cosmodactyla*—*Platyptilia*.  
     *picta*—*Platyptilia*.  
*Lioptilus augustus*—*Pterophorus*.  
     *grandis*—*Pterophorus*.  
     *homodactylus*—*Pterophorus*.  
     *inconditus*—*Pterophorus*.  
     *monodactylus*—*Pterophorus*.  
     *paleaceus*—*Pterophorus*.  
     *parvus*—*Pterophorus*.  
     *subocraceus*—*Pterophorus*.  
     *sulphureodactylus*—*Pterophorus*.  
*Mimescophilus exclamationis*—*Stenoptila*.  
*Cedematophorus baroni*—*Pterophorus*.  
     *cretidactylus*—*Pterophorus*.  
     *eupatorii*—*Pterophorus*.  
     *guttatus*—*Pterophorus*.  
     *gratiosus*—*Pterophorus*.  
     *grisesceus*—*Pterophorus*.  
     *lugubris*—*Pterophorus*.  
*Oxyptilus bernardinis* Gri.  
     *deliwaricus* Zell.  
     *nigrociliatus*—*tenuidactylus*.  
     *ningoris* Wals.  
     *tenuidactylus* Fitch.  
*Platyptilla acanthodactyla* Hueb.  
     *adusta* Wals.  
     *albidorsella* Wals.  
     *albida* Wals.  
     *bertrami*—*marginidactyla*.  
     *cardui*—*carduidactyla*.  
     *carduidactyla* (Ril.)  
     *cooleyi* Fern.  
     *cosmodactyla* Hueb.  
     *fragilis* Wals.  
     *grandis* Wals.  
     *hesperis* Gri.  
     *marginidactyla* Fitch.  
     *marmarodactyla* Dyar.  
     *modesta* Wals.  
     *monticola* Gri.  
     *pasidensis* Gri.  
     *percnodactyla* Dyar.  
     *picta* (Wals.)  
     *shastæ* Wals.  
     *williamsii* Gri.

**Pterophorus augustus** (Wals.)

baccharidis Gri.  
 baroni (Fitch.)  
 behrii Gri.  
 carduidactyla—**Platyptilia**.  
 catalinæ Gri.  
 cretidactylus Fitch.  
 dacteodactylus—**subocraceus**.  
 eupatorii (Zell.)  
 gorgoniensis Gri.  
 grandis (Fitch.)  
 gratosus (Fitch.)  
 grisescens (Walsh.)  
 guttatus (Wals.)  
 hilda Gri.  
 homodactylus Walk.  
 inconditus (Wals.)

**lugubris** (Fitch.)

marginidactyla—**Platyptilia**.  
 monodactylus (Linn.)  
 paleaceus (Zell.)  
 parvus (Wals.)  
 pictipennis Gri.  
 rileyi Fern.  
 subochraceus (Wals.)  
 sulphureodactylus Pack.  
 tenuidactylus—**Oxyptilus**.  
**Stenoptila californica** Gri.  
 exclamationis (Wals.)  
 gorgoniensis Gri.  
**Trichoptilus lobidactylus** Fitch.  
 pygmæus Wals.  
 wrightii Gri

**ORNEODIDÆ.****Alucita hexodactyla**—**Orneodes**.**Orneodes hexadactyla** (Linn.)

montana—**Orneodes hexadactyla**

**TORTRICIDÆ.**

The codling moth, *Cydia pomonella*, is by far the most important member of this family and perhaps of all Lepidoptera. The orange tortrix figured is not of great economic significance.

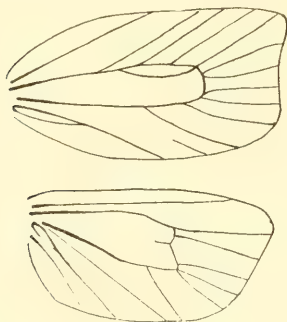


Figure 39. Venation of Tortricidæ

**Alcercys americana** (Fern.)

foliana (Wals.)  
 nvisellana (Wals.)  
 permutana (Dup.)

**Amorbis cuneana** (Wals.)**Anchylopera biarcuana**—**Ancylis**.**Ancylis biarcuana** (Steph.)

cometana (Wals.)  
 comptana (Fol.)  
 pacificana (Wals.)

**Archipsafflictana** (Walk.)

argyrospila (Walk.)

**cerasivorana** (Fitch.)**rosaceana** (Harr.)**virescana** (Clem.)**kindermanniana**—**Phalonia**.**latipunctana**—**Phalonia**.**parallelana**—**Phalonia**.**smeathmanniana**—**Phalonia**.**transversana**—**Phalonia**.**Cydia cupressana** Kear.**inquilina** Kear.**pomonella** Linn.**Diachelia tunicana**—**Epagoge**.**Dichrorampha plumbana**—**Hemimene**.**Carpocapsa californiana**—**Epagagne**.**pomonella**—**Cydia**.**Carposina commonana** Kear.**crescentella** Wals.**Cacœcia argyrospila**—**Archips**.**roseaceana**—**Archips**.**Commophila macrocarpana** Wals.**umbrabascana** Kear.**Conchylis campicolana**—**Phalonia****fernaldana**—**Phalonia**.**intactana**—**Phalonia**.**Eccopsis punctana**—**Exartema**.**Enarmonia americana** (Wals.)**bracteateana** (Fern.)**edwardsiana** Kear.**larimana** Wals.



luna Kear.  
 placerana Kear.  
 tana Kear.  
 trosulana (Wals.)  
 vana Kear.  
 wana Kear.  
 Epagoge californiana (Wals.)  
 tunicana (Wals.)  
 Epinotia augustana Hueb.  
 incarnana (Haw.)  
 lagopana (Wals.)  
 liturana (Wals.)  
 purpurciliana (Wals.)

maculatana (Wals.)  
 miscana Kear.  
 nigralbana (Wals.)  
 paljana (Wals.)  
 palusana Kear.  
 passerana (Wals.)  
 perdricana (Wals.)  
 primulana (Wals.)  
 pulveratana (Wals.)  
 rectiplicana (Wals.)  
 serpentana (Wals.)  
 shastana (Wals.)  
 sonomana Kear.

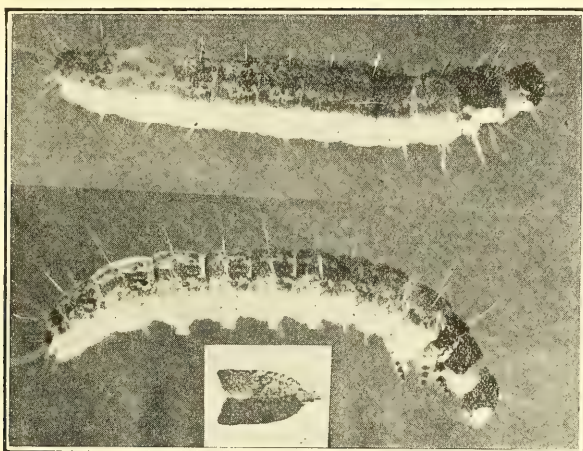


Figure 40. Larvæ and moth of the orange Tortrix.

**Euchromia hemidesma—Olethreutes.**

**Eucosma agricolana (Wals.)**  
 albangulana Wals.  
 atomosana (Wals.)  
 basipunctana (Wals.)  
 biquadrana (Wals.)  
 bolanderana (Wals.)  
 canana (Wals.)  
 cataclystiana (Walk.)  
 crambitana (Wals.)  
 culminana (Wals.)  
 fulminana (Wals.)  
 grandiflavana (Wals.)  
 hirsutana (Wals.)  
 irroratana (Wals.)  
 juncitciliana (Wals.)  
 larana (Wals.)  
 luridana (Wals.)

subplicana (Wals.)  
 terracocana (Wals.)  
 trigeminana (Steph.)  
 vomanana Kear.  
**Eudemis vacciniana (Pack.)**  
**Eulia gloverana (Wals.)**  
 niscana Kear.  
**Evetria colfaxiana Kear.**  
 monophylliana Kear.  
 pasadana Kear.  
 sabiniana Kear.  
 siskiyouana Kear.  
 zozana Kear.  
**Exartema punctana Wals.**  
 Glyphiptera permutana—Alceris.  
 Grapholitha americana—Enarmonia.  
 bracteata—Enarmonia.  
 rössleri—Triodia.

perangustana (Wals.)  
 puncticostana (Wals.)  
 rivulana (Scop.)  
 rubipunctana Kear.  
 scalana (Wals.)  
 subplicana Wals.  
 terracostana Wals.  
 trigeminana Steph.  
 utricana (Hueb.)  
 vetulana (Wals.)  
*Pandemia albaniana* (Wals.)  
 pyrusana Kear.  
*Pedisca*.—*Eucosma*.  
*Penthina conditana*.—*Olethreutes*.  
*consanguiana*.—*Olethreutes*.

trossulana.—*Enarmonia*.  
*Hemimene plumbana* Scop.  
*Herdecanema filiana* Busk.  
 fraternana Busk  
*Hendecastema cuneana*.—*Amorbia*.  
*Hysterosia fulviplicana* (Wals.)  
 inopiana (Haw.)  
*Hystericophora leonana* Wals.  
*Idiographis flaviplicana*.—*Hysterosia*.  
 inopiana.—*Hysterosia*.  
*Laphoderus gloverana*.—*Eulia*.  
*Loxostenia afflictana*.—*Archips*.  
 cerasivorana.—*Archips*.  
 franciscana.—*Tortrix*.  
 rosaceana.—*Archips*.

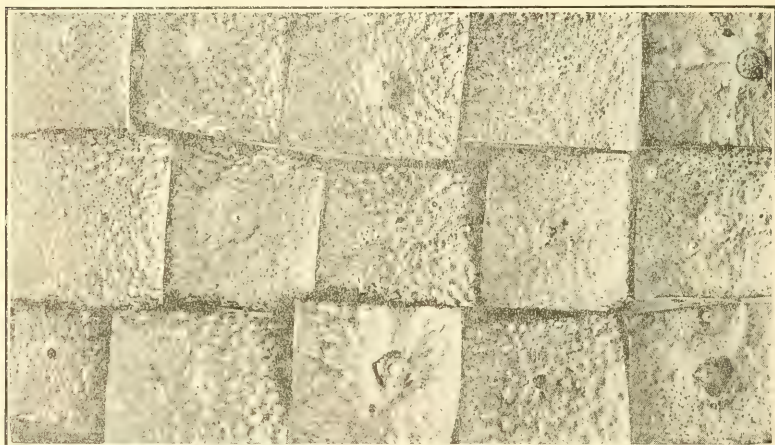


Figure 41 Pieces of orange rind showing entrance holes made by the larva of the orange Tortrix.

hebesana.—*Olethreutes*.  
 hemidesma.—*Olethreutes*.  
*Phæcasiophora*.—*Eucosma*.  
*Phalonia basiochreana* Kear.  
 campicolana (Wals.)  
 carmelana Kear.  
 fernaldana (Wals.)  
 formonana Kear.  
 intactana (Wals.)  
 kindermanniana (Treits.)  
 latipunctana (Wals.)  
 obispoana.—*carmelana*.  
 parallelana (Wals.)  
 smeathmanniana (Fabr.)

virescana.—*Archips*.  
*Mellisopus latiferreanus* Wals.  
*Ænecra inconditana*.—*Sparganothis*.  
 pilleriana.—*Sparganothis*.  
 rudana.—*Sparganothis*.  
 senecionana.—*Sparganothis*.  
*Olethreutes chalybeana* (Wals.)  
 conditana (Wals.)  
 consanguinana (Wals.)  
 grisiocapitana (Wals.)  
 hebesana (Wals.)  
 hemidesma (Zell.)  
 infusca (Wals.)  
 minimana (Wals.)

- transversana* (Wals.)  
*vachelliana* Kear.  
**Phoxopterus** *biarcuana*—Ancylys.  
                   *cometana*—Ancylys.  
                   *comptana*—Ancylys.  
                   *pacificana*—Ancylys.  
**Proteopteryx** *albicapitans* Kear.  
                   *emarginana* Wals.  
**Pseudoconchilis** *laticapitana*  
*Pyrallis* *smeathmanniana*—Phalonia.  
*Retinia* *argyrospila*—Archips.  
*Rhopalobola* *vacciniana* Eudemis.  
*Sciaphila* *afflictana*—Archips.
- urticana* Hueb.  
*vetulana*—Olethreutes.  
**Sparganthis** *inconditana* Wals.  
                   *pillieriana* (Schif.)  
                   *rudna* Wals.  
                   *senecionana* Wals.  
*Smicrates* *virescana*—Archips.  
*Spilonota* *trigeminana*—Eucosma.  
*Steganoptycha* *augustana*—Epinotia.  
                   *incarmana*—Epinotia.  
                   *lagopana*—Epinotia.  
                   *liturana*—Epinotia.  
                   *purpuriciliana*—Epinotia.

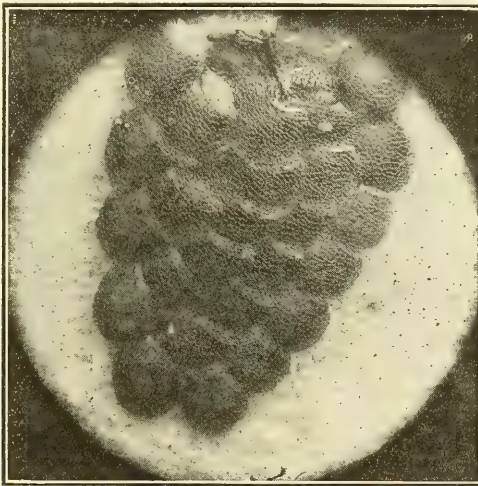


Figure 42. Photomicrograph of the eggs of the orange Tortrix.

- argentana*—Tortrix.  
*hebesana*—Olethreutes.  
*puncticostana*—Olethreutes.  
*trigonana*—Tortrix.  
*vacciniana*—Eudemis.  
**Semasia** *artemisiana* Thiodia.  
                   *bucephaloides* Wals.  
                   *griseocapitana* Wals.  
                   *infusca*—Thiodia.  
                   *minimana*—Thiodia.  
                   *pallidicostana*—Thiodia.  
                   *perangustana*—Thiodia.  
                   *rössleri*—Thiodia.  
                   *terminiana*—Thiodia.  
**Sericaris** *chalybeana*—Olethreutes.  
                   *puncticostana*—Olethreutes.  
                   *rivulana*—Olethreutes.
- Synnoma** *lynosyrana* Wals.  
**Teras** *albaniana*—Pandemis.  
                   *americana*—Alcercys.  
                   *foliana*—Alcercys.  
                   *nvissellana*—Alcercys.  
                   *permutana*—Alcercys.  
**Thiodia** *apachena* Wals.  
                   *artemesiana* (Wals.)  
                   *daracha* Kear.  
                   *griseocapitana* Wals.  
                   *infusca* Wals.  
                   *minimana* Wals.  
                   *offectalis* Hulst.  
                   *pallidicostana* (Wals.)  
                   *perangustana* Wals.  
                   *rössleri* (Zell.)  
                   *scalana* Wals.

*tenuiana* (Wals.)  
*Tinea pomonella*—*Cydia*.  
*Tortrix argentana* Clerck.  
*augustana*—*Epinotia*.  
*citrana* Fern.  
*comptana*—*Ancylis*.  
*franciscana* (Wals.)

*incarnana*—*Epinotia*.  
*inopiana*—*Hysterosia*.  
*pillieriana*—*Sparganothis*.  
*trianguiana* Kea.  
*trigonana* (Wals.)  
*urticana*—*Olethreutes*.

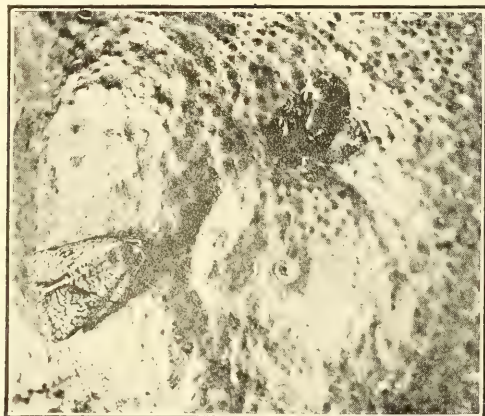


Figure 43. Photograph of an orange Tortrix on an orange near a larval entrance.

#### HYPONOMEUTIDÆ.

*Aræolepia subfasciella* Wals.  
*Calantica polita* Wals.  
*Cerastoma cervella* Wals.  
*instabiliella*—*Trachoma*.  
*koebelella* Dyar.  
*radiatella* Don.  
*sublucella* Wals.

*Chalcæla Gemmalis*—*Choreutis silph-*  
*ella*.

*Choreutis bjerkandella* Thumb.  
*dyarella* Kear.  
*occidentella* Dyar.  
*silphiella* Grote.  
*sororculella* Dyar.

*Euceratia castella* Wals.  
*securella* Wals.  
*Glyphipteryx bifasciata* Wals.  
*californiæ* Wals.

*quinqueferella* Wals.  
*regalis* Wals.  
*unifasciata* Wals.

*Orchemia diana* Hueb.  
*Periclymenobius canariellus* Wals.  
*dentiferellus* Wals.  
*frustellus* Wals.

*Plutella albidorsella* Wals.  
*cruciferarum*—*maculipennis*.  
*maculipennis* Curt.  
*omissa* Wals.  
*porrectella* Linn.  
*vanella* Wals.

*Setiostoma fernaldella* Ril.  
*Trachoma falciferella* Wals.  
*instabilella* Wals.  
*senex* Wals.

#### GELECHIIDÆ.

The peach worm, *Anarsia lineatella* was particularly troublesome to growers of peaches for eastern shipment, until the discovery of the efficiency of spraying with lime sulfur after the buds were swollen. (See California



Bulletin 144). Another important pest is the potato worm *Phthorimæa operculella*. (See California Bulletin 135).

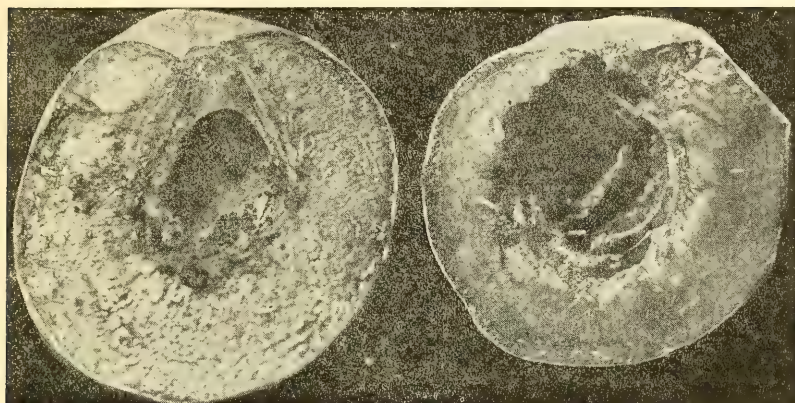


Figure 44. Peach showing a peach worm and its work.

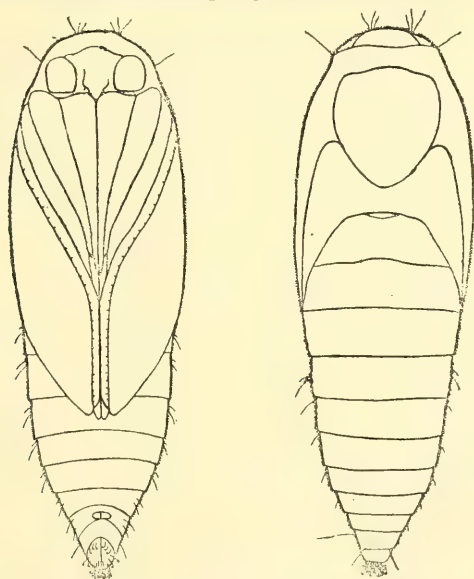


Figure 45. Pupa of the peach worm.

*Anacampsis rhoifructella* (Clem.)  
*Anarsia lineatella* Zell.

*Aristotelia argentifera* Busk.  
*roseosuffusella* Clem.

*Cleodora canicostella*—*Paltodora*.  
*modesta*—*Paltodora*.  
*sabulella*—*Paltodora*.  
*striatella*—*Paltodora*.  
*tophella*—*Paltodora*.  
*Dactylota snellenella*—*Neodactyla*.

*operculella*—*Phthorimæa*.  
*pauella* (Colorado).  
*rhoifractella*—*Anacampsis*.  
*roseosuffusella*—*Aristotelia*.  
*thoracestrigella* Chamb.  
*variabilis* Busc.

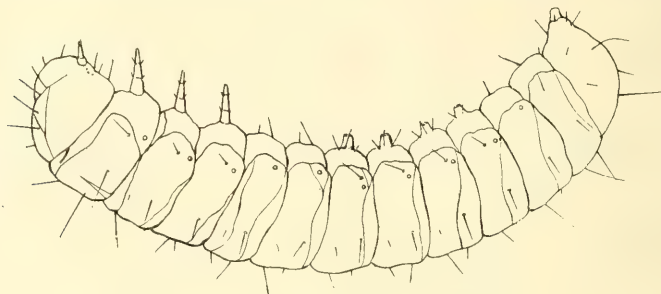


Figure 46. Young larva of the peach worm.



Figure 47. Section of a bud showing the spring burrow of the peach worm.



Figure 48. Winter nest of the peach worm.

*Deoclona yuccasella* Busk.  
*æquepulpella*—*Glyphidocera*.  
*apicitripunctella*—*Recurvaria*.  
*Eucatoptus striatella*—*Phthorimæa*.  
*Gelechia discostrigella* Chamb.  
*griseochrella* Chamb.  
*lacteochorella* Chamb.  
*maculatusella* Chamb.  
*occidentella* Chamb.  
*ocherfussella* Chamb.  
*ochreostrigella* Chamb.  
*octomaculella*—*Gnorimoschema*.

*Glyphidocera æquipulpella* (Cham.)  
*Gnorimoschema baccharisella* Busk.  
*coquilletella* Busc.  
*octomaculella* (Chamb.)  
*tetradymiella* Busc.  
*Lita solanella*—*Phthorimæa operculella*.  
*Neodactylata snellenella* Wals.  
*Paltodora canicostella* (Wals.)  
*modesta* (Wals.)  
*sabulella* (Wals.)  
*striatella* (Hueb.)

tophella (Wals.)  
*Phthorimæa operculella* (Zell.)

striatella (Murt.)  
*Recurvaria apictripunctella* Clem.

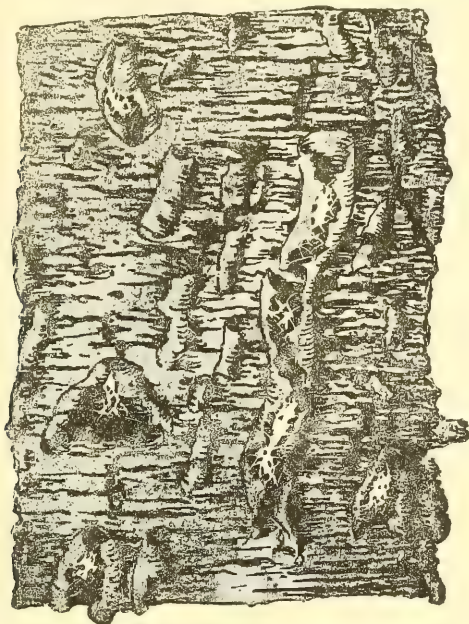


Figure 49. Cocoons of the peach worm in the curls of the bark.

#### XOLORICTIDÆ.

*Ide osseella* Wals.

#### ÆCOPHORIDÆ.

*Depressaria arenella* Schif.

*argillacea* Wals.  
*arnicella* Wals.  
*ciliella* Stain.  
*emeritella* Stain.  
*klamathiana* Wals.  
*novimundi* Wals.  
*nubiferella* Wals.  
*posticella* Wals.  
*psoraliella* Wals.  
*sabulella* Wals.  
*thoracefasciella* (Cham.)  
*thoracenigraella* (Cham.)  
*togata* Wals.  
*umbraticostella* Wals.

*Endrosis lactella* D. & S.

*Ethmia albistrigella* Wals.

*albitogata* Wals.  
*arctostaphyella* Wals.  
*monticola* Wals.  
*obscuraella* Beut.  
*subcærulea* Wals.

*Æcophora dimiella* Wals.

*pseudospretella* Wals.

*Psecadia albistrigella*—*Ethmia*.

*arctostaphyella*—*Ethmia*.

*monticola*—*Ethmia*.

*obscuraella*—*Ethmia*.

*subcærulea*—*Ethmia*.

*Setiostoma fernaldella* Ril.

*Walsinghamia diva* Ril.

## BLASTOBASIDÆ.

- |                                  |                            |
|----------------------------------|----------------------------|
| Blastobasis iceryælla—Holcocera. | inconspicua Wals.          |
| Dryope canariella Dietz.         | irenica Wals.              |
| occidentella Dietz.              | gigantella Cham.           |
| fenyesella Dietz.                | stygna Wals.               |
| Holcocera iceryælla Ril.         | Valentina glandulella Ril. |

## ELACHISTIDÆ.

- |                               |                                  |
|-------------------------------|----------------------------------|
| Butalis aterrimella—Scythris. | vagans Wals                      |
| ochristriata—Scythris.        | viridicuprella Wals.             |
| perspicella—Scythris.         | viscidiflorella Wals.            |
| suffusa—Scythris.             | wythiæ Wals.                     |
| Coleophora accordella Wals.   | Cosmopteryx unicolorella Wals.   |
| acutipenella Wals.            | Heliodines bella Chamb.          |
| bella Wals.                   | extraniella Wals.                |
| costipenella Wals.            | unipunctella Wals.               |
| cornella Wals                 | Laverna bifasciella—Mompha.      |
| discostrata Wals.             | decorella—Mompha.                |
| glauca Wals.                  | subbistrigella—Mompha.           |
| glutinosa (undetermined.)     | unifasciella—Mompha decorella.   |
| irroratella Wals.             | Scythris aterrimella (Walk.)     |
| lapidicornis Wals.            | ochristriata (Walk.)             |
| laricella Hueb.               | perspicella (Walk.)              |
| lynosyridella Wals.           | suffusa (Walk.)                  |
| ochrella Cham.                | Mompha bifasciella Chamb.        |
| ochrostriata Wals.            | decorella (Steph.)               |
| pruniella Clem.               | subbistrigella (Haw.)            |
| tennis Wals.                  | Schreckensteinia felicella Wals. |

## TINEIDÆ.

The Tineidæ are best known because of three household pests; the clothes moth, Tineola, the carpet moth, Trichophaga and the fur moth, Tinea pellionella. Of greatest scientific interest are the yucca moths, Pronuba being necessary to fertilize the blossoms and Prodoxus living on the flower stems can come to maturity only where the Pronuba has performed its work. Yucca brevifolia is attended by Pronuba paradoxa and Prodoxus sordidus Yucca baccata and other allied yuccas are fertilized by Pronuba yuccasella and furnish food for Prodoxus coloradensis and y-inversa, and Yucca whipplei has Pronuba maculata and all the remaining species of Prodoxus.

- |                               |                                       |
|-------------------------------|---------------------------------------|
| Adela fasciella—Trigrapha.    | Agryrestia cuprasella Wals.           |
| flamesella Cham.              | mendica Haw.                          |
| lactimaculella—flammeusella.  | plicipunctella Wals.                  |
| punctiferella Wals.           | onagella Dietz.                       |
| septentrionella Wals.         | pandurella Dietz.                     |
| trifasciella Cham.            | Bebellia somnulentella Zell.          |
| trigrapha Zell.               | Buculatrix euratiella (undetermined). |
| Amydria coloradella Dietz.    | Cremastobombycia grindelilella—Lith-  |
| confusella Dietz.             | ocoletes.                             |
| obliquella Dietz.             | Epielegis cariosella Dietz.           |
| occidentella—onagella.        | Calopacta glutinosi Wals.             |
| Apotomia fractilinella Dietz. | Cerostoma flavistrigella Busk         |
| Apreta paradoxella Dietz.     | Epichata nepotella Dietz.             |



*Eriocrania cyanosparsella* Wil.  
*Ethmia albatogata* Wals.  
*Gracilaria behrensella* Chamb.  
*elongella* Linn.  
*fuscocochrella* Beut.  
*nigristrigella* Beut.  
*grindeliella* (Wals.)  
*incanella* Wals.  
*insignis* Wal.  
*ledella* Wals.  
*leucothorax* Wals.  
*mediodorsella* Braun.  
*memoris* Wals.  
*propinquella* Braun.  
*salicifoliella* Clem.  
*umbellinariae* Wals.

*Monopsis crocicapitella* Clem.  
*rusticella* Hubn.

*Ortholophus variabilis* Wals.  
*Paralechia californica* Busk.  
*Phyganeopsis brunnea* Wals.  
*Pliniaca bakerella* Busk.  
*sparsisquamella* Busk.

*Prodoxus aenescens* Ril.  
*cinereus* Ril.  
*coloradensis* Ril.  
*marginatus* Ril.  
*pulvulentus* Ril.  
*reticulatus* Ril.  
*sordidus* Ril.  
*y-inversus* Ril.

*Pronuba maculata* Ril.  
*paradoxa* Ril.  
*synthetica*—*paradoxa*.  
*vuccasella* Ril.

*Paraneura cruciferella* Dietz.  
*Phryganopsis brunnea* Wals.  
*Scardia gracilis* Wals.  
*Semiota transversistrigella* Dietz.  
*Setomorpha majorella* Dietz.  
*Tinea arcella* Fabr.

*ehrhorniella* Dietz.  
*simulella* Dietz.  
*behrensella* Chamb.  
*cloacella* Haw.  
*defectella* Zell.  
*geniculatella* Dietz.  
*molybanella* Dietz.  
*niveocapitella* Chamb.  
*occidentella* Chamb.  
*pellionella* Linn.

*Tineola biselliella* Linn.  
*Tscheria badiella* Chamb.

*ceanothi* Wals.

*sulphurea*—*badiella*.

*Trichophaga tapetzella* Linn.  
*ruptostrigella*—*nigristrigella*.  
*sanguinella* Cham.  
*sauzalitoella* Cham.  
*shastella* Beut.

*Greya humilis* (Wals.)  
*mediostriata*—*Isocorypha*.  
*punctiferella* (Wals.)  
*solenobiella* (Wals.)

*Homoseta maculatella* Dietz  
*Incurvaria humilis*—*Greya*.  
*punctiferella*—*Greya*.

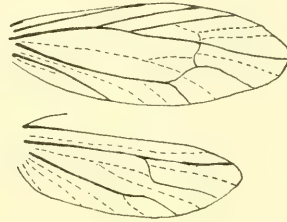


Figure 50. Venation of the larger Tineidae.

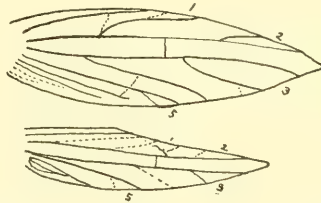


Figure 51. Venation of the smaller Tineidae.

*solenobiella*—*Greya*.

*Lecithocera flavistrigella*—*Greya mediostriata*.

*faginella* (European.)

*Lithocolletes agrifoliella* Braun.

*alnicolella* Wal.

*alniella* (European.)

*apicinigrella* Braun.

*arbutusella* Braun.

*basistrigella* Chamb.

*conglomeratella* Zell.

*HEPIALINA.***HEPIALIDÆ.****Hepialis anceps montanus.**

baroni—montanus.

behrensii Stretch.

californicus Boisd.

hectoides Boisd.

hyperboreus Mots.

inutilis—hectoides.

lembertii Dyar.

lenzi—hectoides.

meglashani—hyperboreus.

mendocineolus—sequoiolus.

modestus—hectoides.

montanus Stretch.

rectus—montanus.

sequoiolus Behrens.

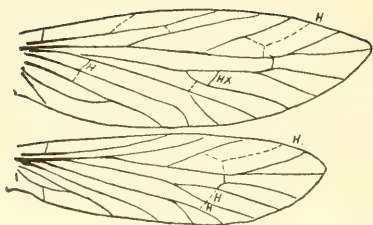


Figure 52. Venation of Hepialidæ and Micropterygidæ.

**MICROPTERYGIDÆ.****Epimartygyia pardella (Wals.)****Eriocephala aurosparsella (Wals.)****Micropteryx aurosparsella—Erioceph-**  
**ala.**

pardella—Epimartyria.

## HYMENOPTERA.

In the geological stratum in which the first moths appear there are representatives of most of the larger groups of Hymenoptera, indicating that it is an older order. The structure of the lower forms shows a very close relationship with the Lepidoptera and with the Trichoptera universally recognized as the ancestor of Lepidoptera. From the same group the Hymenoptera must also have sprung. The adult insect does not give any very clear evidence of this or of any other relationship.

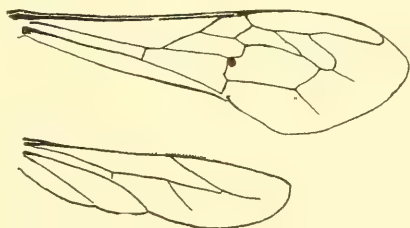


Figure 53. Venation of the Honey bee.

The most distinctive structure is the dominance of three series of cross-veins in the wing which render the venation difficult to interpret or compare with other venations. The first series of cross-veins extends from the front edge just before the node obliquely towards the base till it reaches the next vein, then turns squarely towards the next vein beyond, marking off two comparatively large basal cells. The second zigzags directly across the wing touching the costa just beyond the node. The third is a little more indefinite. It is usually about midway between the second crossveins and the tip of the wing. The usual conception of the venation hinges on the marginal cell, which is the large cell along the costa beyond the node. Below this are two or three submarginal cells and the remainder of the closed cells are called discoidal cells. The veins radiating from the marginal cell are

called transverso-cubital veins. The cubital vein arises from the basal cross-vein. On the other side of the cubital there are usually two cross veins which because of their direction are called recurrent veins.

A system of formulæ has been devised for expressing the salient features of a venation and to aid in rapid identification of groups. The plan is to number the bars surrounding the discoidal cell between the recurrent veins. The first recurrent vein is numbered 1, then along the cubital to the first transverso-cubital vein is numbered 3. etc. Even numbers are given to the bars beneath the cell. Where bars are without the cell as is common with bar 3, it is indicated by as \*. The formula consists in naming in the order of size, the bars of a venation, enclosing in parentheses such as may be about equal in size.

Below will be found the formulæ of most of our genera of bees:—

Colletidæ	Colletes	4 1 6 2 3* 7 5 9*
Prosopidæ	Prosopis	4 1 5 6 2 7*
Andrenidæ	Andrena	4 1 5 2 6 3* 7*—4 1 (2 6 7) 3* (5 9*)
	Haliectus	1 4 6 3* 7 2 9* 5—4 1 7 2 3* 9* 5
		1 4 6 (2 7) 3* 9* 5
	Sphecodes	1 6 4 2 7 9* 3* 5
	Agapostemon	4 1 6 7 2 3* 9* 5
Panurgidæ	Calliopsis	4 1 6 5 2 3* 7*
	Panurginus	4 1 (5 6) 2 3* 7*
	Diandrena	4 1 6 5 2 3* 7*
	Perdita	1 5 2 3*
Anthophoridæ	Anthophora	1 4 6 2 7 (3* 5) 9*—4 1 6 2 7 3* 5 9*
	Melissodes	4 1 7 (2 6) 3* 5 9
	Tetralonia	4 1 7 2 6 3* 5 8*
	Xenoglossa	4 1 7 6 2 3* 5 9*
Melectidæ	Pseudomelecta	1 4 6 2 3* 7 9* 5
	Epiolus	1 4 6 2 7 5 3* 9*
Xylocopidæ	Xylocopa	4 1 6 5 2 7* 3*
Megachilidæ	Alcidamia	4 1 6 2 5 3* 7*
	Anthidium	6 5 4 1 2 3* 7*
	Chelostoma	4 1 5 6 2 7* 3*
	Megachile	4 5 1 6 2 3* 7*
	Osmia	4 1 6 5 2 3* 7*
	Ashmeadella	4 1 6 5 2 3* 7*
Nomadidæ	Nomada	1 4 6 2 3* 9* 7 5—1 4 6 2 3 7 (5 9)
	Melecta	4 1 6 2 3* 7 9* 5
Ceratinidæ	Ceratina	4 1 6 7 3* 2 9* 5
	Bombus	4 1 6 7 5 2 3* 9*
Bombidæ	Psythyrus	4 6 1 7 2 5 3* 9*
Apidæ	Apis	4 5 6 1 2 7 3* 9*



The difficulty already alluded to in comparing the venation found in this order can be solved in one of two ways, either by assuming 1st. a great amount of fusion of the elements of the venation and of rearrangements of position, or 2nd. simply the suppression of certain parts.

The former has been worked out in detail by Comstock and Mac Gillvray. They assume that the media is fused with the radius until just before the node where it is turned obliquely backward to the base of the cubitus and then

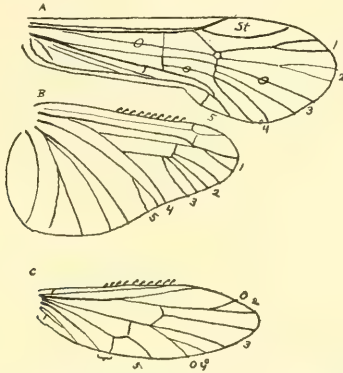


Figure 54. Venation of Trichopterygidae. A. and B. *Chloropsyche*. C. *Helicopsyche*. 1-5 notation of veins used in that order. St. area in which stigma is supposed to develop. O. veins which are vestigial in Hymenoptera.

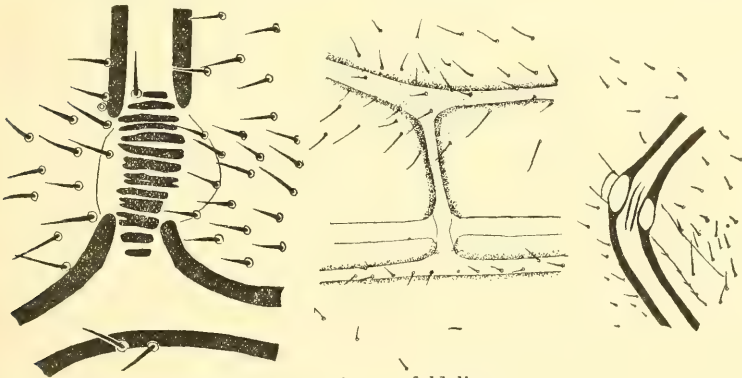


Figure 55. Three interruptions of veins on fold lines.

turned outward again to the base of the first recurrent which is its posterior branch; both branches subsequently fork and ultimately the tips unite as follows: the upper fork with two branches of the radius, the two middle forks with each other thus enclosing the third discal cell, and the lower fork

with the tips of the cubital and anal veins.

The second solution explains the peculiar crookedness of the median cross-veins and the spurs projecting from it into the second and third discoidal cells and from the first cross-vein into the first basal cell, as vestiges of suppressed veins which, if added, would at once make this wing conform in every essential feature with the wing of the Trichoptera.

There are two fold lines in the front wing in Hymenoptera, best developed in the paper wasps and their allies where the wings at rest are completely folded flat, making the wing appear to be very narrow.

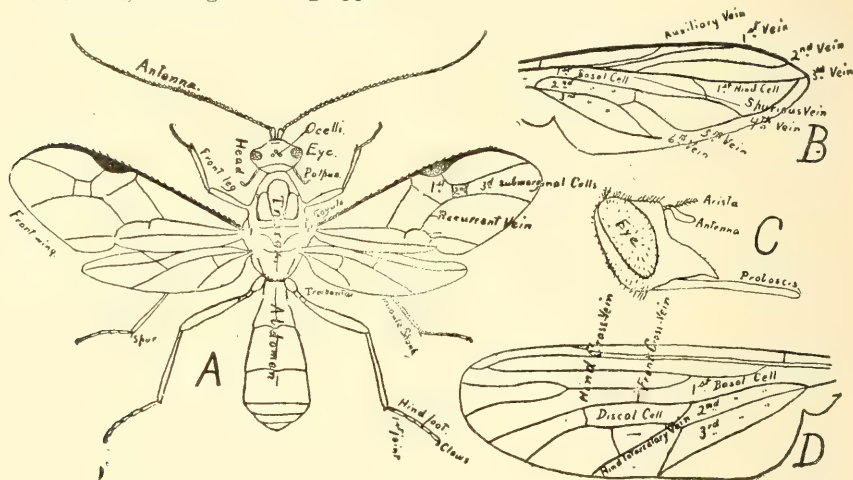


Figure 56. showing names of structures in Hymenoptera and Diptera.

#### SYNOPSIS OF FAMILIES.

**Ichneumonidæ**: first cubital and first discoidal cells confluent and both recurrences present.

**Proctotrupidæ**: ovipositor at tip of abdomen. **Pelecinidæ**: abdomen very long and slender.

**Mutillidæ**: body densely clothed with hair.

**Anthophoridæ**: tongue long and a dense brush on hind tibiæ. **Apidæ** and

**Bombidæ**: hind tibiæ concave on outer end, the first being devoid of spurs on hind tibiæ. **Xylocopidæ**: marginal cell long.

**Megachilidæ**: densely hairy beneath abdomen.

**Cynipidæ**: veins distant from costa. **Ceroptridæ**: second abdominal segment covering nearly the whole abdomen.

**Formicidæ**: abdomen constricted at base forming one or two hump-like segments.

**Braconidæ**: pronotum touching tegulæ, and trochanter two-jointed, **Ean-**

**iidæ**: abdomen attached to dorsum of thorax. **Alysiidæ**: mandibles spreading outwardly.

**Crysididæ**: abdomen of three to five segments, hollowed out beneath.

**Nomadidæ**: first joint of hind feet long, and three cubital cells. **Andrenidæ** and **Coletidæ**: basal joints of labial palpi similar to outer joints, the last with tongue acute. **Ceratinidæ**: marginal cell long.

**Encyrtidæ**: trochanters two-jointed, **Eulophidæ**: axillæ reaching as far as opposite the tegulæ. **Torymidæ**, **Eurytomidæ**, **Miscogasteridæ**, **Cleonidæ** and **Pteromalidæ**: female with femoral furrows, the last with but one spur on hind tibiæ, the first with pronotum elongate or hind coxæ longer than front coxæ; the second with pronotum subquadrate, and fourth with mesepisternum large and triangular.

**Tenthredinidæ**: abdomen not at all constricted at base, third submarginal receiving a recurrent vein, **Hylatomidæ**: antennæ three-jointed. **Doleridæ**: basal vein joining cubital. **Selandriidæ**: only three submarginal cells. **Pamphiliidæ**: prothorax not emarginate behind.

**Nematidæ**: abdomen not constricted at base. **Cimbicidæ**: antennæ clavate. **Panurgidæ**: first joint of feet long. **Prosopidæ**: no pollen brush on hind femora.

**Crabronidæ**: only one cubital cell. **Oxybelidæ**: first cubital and first discoidal cell confluent.

**Philanthidæ**: gaster constricted between first and second segments.

**Trypoxylidæ**: head not wider than thorax. **Thynnidæ** and **Scoliidæ**: prothorax touching tegulæ, the latter with middle coxæ distant.

**Sphecidæ**: prothorax distant from tegulæ. **Bembecidæ**, **Larridæ**, **Stizidæ** and **Nyssonidæ**: abdomen sessile, the first two with but two spurs on middle tibiæ, the second and fourth with labrum concealed by clypeus.

**Pemphredonidæ**: but two spurs on middle tibiæ.

**Eumenidæ**: wings folded longitudinally. **Vespidæ**: claws simple.

**Psamocharidæ**, **Marsaridæ** and **Sapygidæ**: hind femora shorter than abdomen, the former with antennæ clavate.

## APINA.

### APIDÆ

The family is represented by a single introduced species, the common honey bee. There are two forms of females, the queen and the workers, the latter very rarely reaching sexual maturity, and then laying unfertilized eggs developing into males or drones. The eggs laid by the queen that produce males are likewise unfertilized. All eggs hatch in about three days; the young larvæ are given a special food secreted by the workers, for three days in the case of workers and drones, but queen larvæ receive the royal jelly

thru the whole six days of its feeding life, a mixture of pollen and honey being fed to the others, and they do not grow so rapidly. After feeding is ended the cells are capped over with wax and the imprisoned larva spins a cocoon, pupates and finally emerges. The total time required from the de-



Figure 57. Relief map of California showing honey regions.

deposition of the egg to the appearance of the full grown insect is, queen 18 days, worker 21 days, and drone 24 days. Each form of bee is produced in cells of different size. Workers develop in the ordinary comb having five cells to the inch. Drone comb is similar but with about four and a half cells to the inch and in closing the cell the cap is made dome-shaped. The queen cells are made singly, have very thick and uneven walls, open outwardly, and are about half an inch in diameter and perhaps an inch long.



When a colony becomes too numerous provision is made for increase by producing and stocking with eggs a quantity of drone comb, then a variable

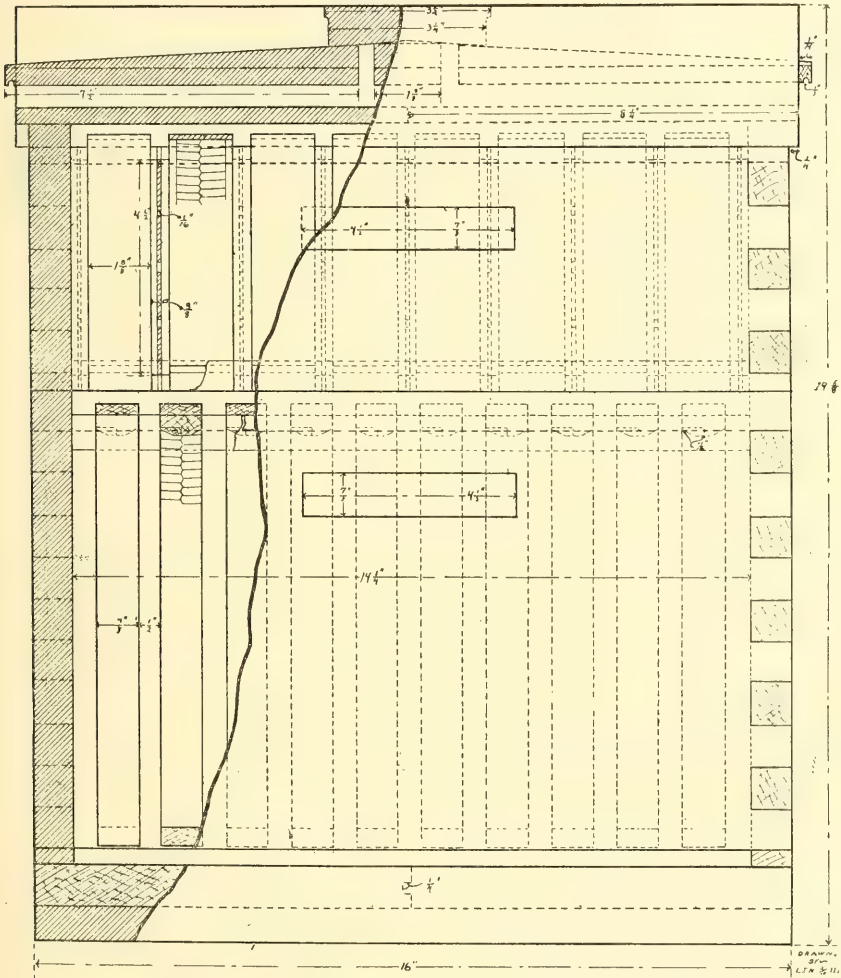


Figure 58. Details of standard bee hive.

number of queen cells are built and stocked, and as the new queens are about ready to emerge, the old queen and most of the older bees swarm forth

tents except that each worker carries off a crop full of honey.

After the swarm adopts new quarters the workers proceed to make wax from the honey which they have eaten by massing together till the body temperature is sufficient to start secretion in the wax glands beneath the abdomen. The jaws are used as wax modeling tools.

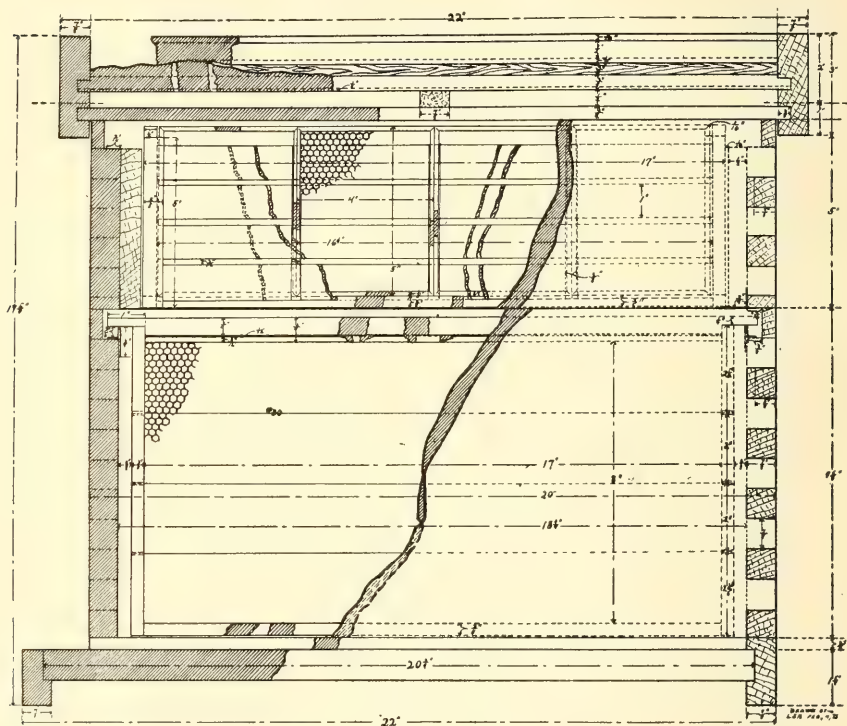


Figure 59. Details of standard bee hive.

Besides honey carried in the crop, the bees carry pollen on their hind legs and gather various vegetable gums, the propolis, used to calk the hive.

Bee keeping is a large industry in California, some producing honey by the car load. Most of the honey is extracted by centrifugal machines and sold in five gallon cans. Bees wax is a by product.

California Experiment Station Publications: Circular 63 Observation hive. Bulletin 217 Honey plants.

*Apis mellifera* Linn.

mellifica—mellifera.

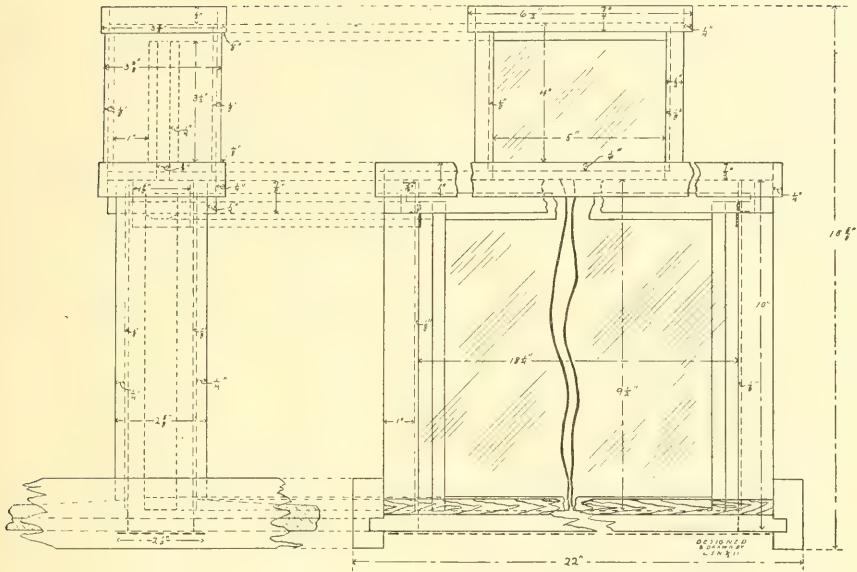


Figure 61. Details of construction of an observation hive.

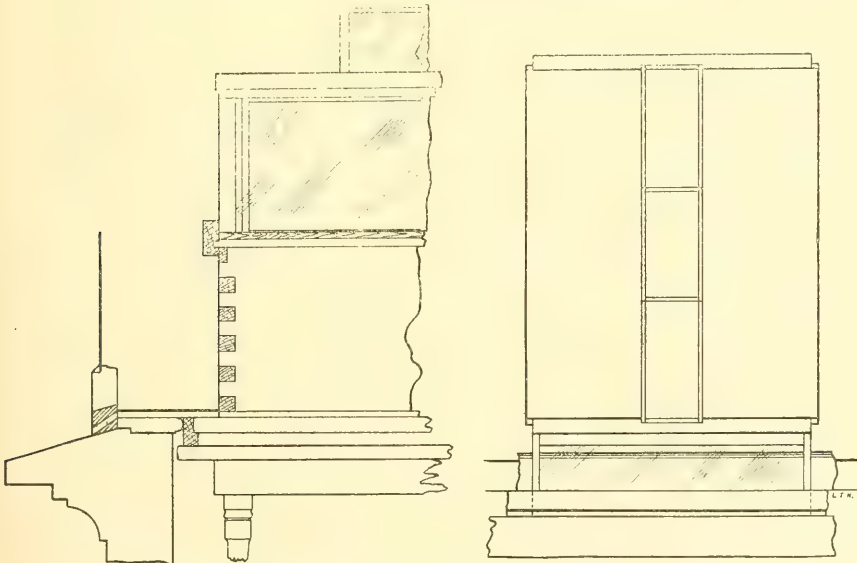


Figure 62. Details of construction of an observation hive.

**BOMBIDÆ**

The bumble bees are strictly social insects but the colonies only exist during the summer months. The queen makes a nest in the ground in the spring. The first workers produced are very small. When the colony becomes populous the queen ceases to forage and finally towards fall numerous drones and queens are produced, the latter after mating seek each a secluded place for hibernation. *Psthyrus* lives in the nests of bumble bees, and are difficult to distinguish from them. They have no worker cast.

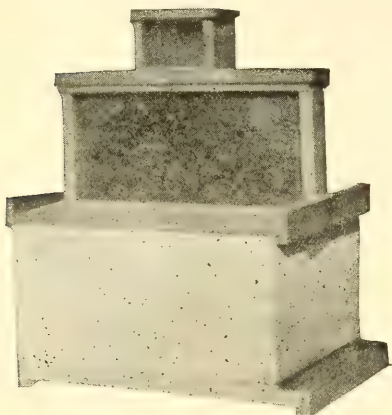


Figure 60. Observation hive.

Figure 63. *Ceratina*.

*Aphathus californicus*—**Bombus**.

*Apis fervidus*—**Bombus**.

**Bombus ambiguus** Fra.

*appositus* Cr.

*californicus* Sm.

*californicus*—*vosnesenskii*.

*centralis* Cr.

*columbicus*—**Bombus vosnesenskii**.

*crotchii* Cr.

*dorsalis*—**Bombus fervidus**.

*edwardsii* Cr.

*edwardsii*—*fernaldii*.

*edwardsii*—*rufocinctus*

*fernaldii* Fra.

*fervidus* Fabr.

*henshawi* Fra.

*howardii*—*occidentalis*.

*huntei* Cr.

*mixtus* Cr.

*morrisoni* Cr.

*nevadensis* Cr.

*nigrocinctus*—*crotchii*.

*occidentalis* Green.

*rufocinctus* Cr.

*sitkensis* Nyl.

*sonorus* Say.

*suckleyi*—*Psythyrus*.

*vosnesenskii* Rad.

*Psythyrus californicus*—**Bombus**.

*crawfordii* Fra.

*suckleyi* Gr.

*Ceratina acantha* Prov.

*submaratima*—*acantha*

*dupla* Say.

**CERATINIDÆ.**

*gigantea* Sm.

*pacificus* Sm.

*tejonensis*—*dupla*.



## NOMADIDÆ.

All of the members of this family live in the nests of other bees.



Figure 64. *Nomada*.

*Bombomelecta edwardsi* Cr.  
*pacifica* Cr.  
*separata* Cr.  
*thoracica* Pat.  
*zygos* Vier.  
*Epeolus californicus* Cr.

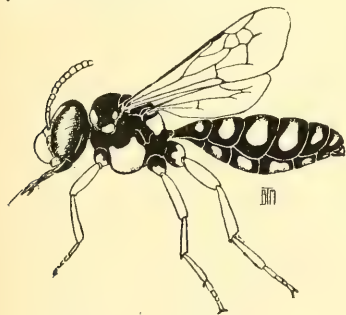


Figure 65. *Melecta*.

*concavus* Cr.  
*compactus* Cr.  
*faciatus*  
*nevadensis* Edw.  
*nigroceps* Sm.  
*occidentalis* Cr.  
*superbus*  
*Melecta californica* Cr.  
*edwardsii* Cr.  
*thoracicus* Cr.  
*Nomada angelarum* Co.

*ashmeadi* Co.  
*atrofrontata* Co.  
*ashmeadi* Co.  
*australior—edwardsii*  
*bifurcata* Co.  
*bisignata* Say.  
*californiae* Co.  
*citrina* Cr.  
*civilis* (Colorado)  
*coquilletti* Co.  
*crotchii* Cr.  
*10-punctata* Co.  
*edwardsii* Cr.  
*elegantula* Co.  
*excellans* Co.  
*excurrens* Co.  
*flavipes* Prov.  
*formula* Vier.  
*fragilis* Cr.  
*hesperia* Co.  
*humphilli* Co.  
*interrupta—interruptella*  
*interruptella* Fow.  
*latifrons* Co.  
*lepida* Cr.  
*marginella* Co.  
*melliventris* Cr.  
*nigrior—crotchii*  
*obliquella* Fow.  
*obliqua—obliquella*  
*obscura—obscuraella*  
*opposita* Cr.  
*oregonica* Co.  
*pascoensis* Co.  
*phodosoma* Co.  
*rhodotricha* Co.  
*rivalis* Cr.  
*rubra* Prov.  
*sanctaecrucis* Co.  
*suavis* Cr.  
*subangusta* Co.  
*subgracilis* Co.  
*subsimilis* Co.  
*subvicinalis* Co.  
*tintinnabulum* Co.  
*ultimella* Co.  
*Phileremus fulviventris* Cr.  
*vinnula* (not California).  
*Perdita californica* Cr.  
*claypolei* Co.  
*interrupta* Cr.  
*Stelis carnifex* Co.

*laticincta* Cr.  
*subcærulea* Cr.

*sexmaculata* Ash.

#### MEGACHILIDÆ.

This family contains the leaf cutting bees, *Megachile*, which cut round or oval holes in the leaves of various plants, particularly roses; these are used to line their nests. *Anthidium* gathers cottony materials from plants for the same purpose.



Figure 66. Leaf cutting bee, *Megachile*.

#### SYNOPSIS OF GENERA.

*Osmia*: pulvillus present, *Chelostoma* and *Heriades*: maxillary palpi three-jointed, the latter with mandibles tridentate. *Alcidamia*: male antennæ deformed.

*Anthidium*, *Megachile*: second submarginal receiving both recurrents.

*Alcidamia producta* Cr.  
*Anthidium atriventris* Cr.  
     *californicum* Cr.  
     *compactum*  
     *consimile*  
     *edwardsii* Cr.  
     *emarginatum* Say.  
     *illustre* Cr.  
     *maculifrons* Cr.  
     *maculosum* Cr.  
     *pallidiventris* Cr.  
     *provancheri* Tit.  
     *tricuspidum*

*Chelostoma australis* Co.

*californicum* Cr.  
*Heriades albicinctum* Prov.  
     *glaucum* Fow.  
     *semirubra* Co.  
*Megachile brevis* Cr.  
     *exilis*  
     *fidelis* Cr.  
     *frigida*  
     *latimanus*  
     *montivagus* Cr.  
     *pugnata* Say.  
     *studiosa*  
*Osmia abjecta* Cr.  
     *albiventris* Cr.

armaticeps Co.  
 atriventris Cr.  
 brevis Cr.  
 californica Cr.  
 cobaltina Cr.  
 davidsoniella Co  
 dubia Cr.  
 exigua Cr.

lignaria Say.  
 manura Cr.  
 nigrifrons Cr.  
 purpurea Cr.  
 quadriceps Cr.  
 rustica Cr.  
 titusi Co.

## XYLOCOPIDÆ.

The carpenter bees are as large as bumblebees. The female burrows into wood making a tube several inches long which is separated into a series of cells, each for a single larva which eats pollen and honey stored by the parent.

*Xylocopa æneipennis* DeG.  
*californica* Cr.  
*fimbriata* Fabr.  
*oxpifex* Sm.  
*varipuncta* Pat.



Figure 67. Carpenter bee, *Xylocopa*.

## ANTHOPHORIDÆ.

*Alcyloscelis afflicta*—*Diadasia*.  
*alboresta*—*Diadasia*.  
*australia*—*Diadasia*.  
*bituberculata*—*Diadasia*.  
*cinera*—*Diadasia bituberculata*  
*diminuta*—*Diadasia*.  
*enavata*—*Diadasia*.  
*freisei*—*Diadasia*.  
*laticauda*—*Diadasia*  
*nerna*—*Diadasia nigrifrons*.  
*nigrifrons*—*Diadasia*.  
*nitidifrons*—*Diadasia australis*  
*opuntiae*—*Diadasia australis*.  
*rincornis*—*Diadasia australis*.  
*Anthophora tricineta*—*Diadasia af-*  
*flcta*.  
*abruptella* Co.  
*anstrutheri* Co.  
*californica* Cr.  
*catalinæ* Co.  
*corvicolor*—*infernalis*.  
*crotchii* Cr.  
*curta* Prov.  
*edwardsii* Cr.  
*exigua* Cr.

*flavocincta* Huard.  
*flexilipes* Cr.  
*floridana*—*Habropoda*.  
*ignava* Cr.  
*infernalis* Dal.  
*maculifrons*—*petrophila*.  
*miserabilis*—*Habropoda*.  
*nigrocincta*—*flavocincta*.  
*ornata*  
*pacifica* Cr.  
*petrophila* Co.  
*solitaria* Ritz.  
*stanfordiana* Co.  
*subtarsata*—*tarsata*.  
*tarsata* Sick.  
*urbana* Cr.  
*Anthophorula coquilletti*—*Eucera*.  
*Centris cockerelli* Fox.  
*davidsoni*—*hoffmansegiae*.  
*hoffmansegiae* Co.  
*Diadasia afflicta* Cr.  
*alboresta* Prov.  
*bituberculata* Cr.  
*cinerea*—*bituberculata*.  
*diminuta* Cr.

- enavata* Cr.  
*freisei* Co.  
*laticauda*—*Alcyloscetus*.  
*nerea*—*nigrifrons*.  
*nigrifrons* Co.  
*nitidifrons* Cr.  
*rinicornis*—*australis*.  
*tricincta*—*afflicta*  
*Disiaspls olivacea* Cr.  
*Emphoropsis interspersa* Co.  
   *opuntiae*—*australis*.  
   *miserabilis* Cr.  
   *murihirta* Co.  
   *semifulva* Co.  
   *tristissima* Co.  
*Eucera coquilletti* Ash.
- enavata*—*Diadasia*.  
*intermediella* Co.  
*intrudens*—*Tetralonia*.  
*lupina* Cr.  
*menucha* Cr.  
*nigrifrons* Cr.  
*obliqua*  
*olivaceae* Cr.  
*personatella* Co.  
*semilupina*—*menucha*.  
*smithii* Dal.  
*sternsii* Co.  
*stretchii*—*Tetralonia*.  
*tepida* Cr.  
*Synhalonia acerba*—*Tetralonia*.  
*albicans*—*Tetralonia*.

Figure 68. *Diadasia*.

- Habropoda depresa* Fow.  
   *floridana* (Sm).  
   *miserabilis* Cr.  
*Macrocera pruinosa*—*Xenoglossa*.  
*Macrotera californica* Cr.  
*Mellisodes actiosa*—*Tetralonia*.  
   *bituberculata* Cr.  
   *californica*—*smithii*.  
   *catalinensis*—*intermediella*.  
   *edwardsii*—*Tetralonia*.
- albopillosa*—*Tetralonia*.  
*californica*—*Tetralonia*.  
*edwardsii*—*Tetralonia*.  
*intrudens*—*Tetralonia*.  
*speciosa* (Colorado).  
*Tetralonia acerba* (Cr.)  
   *actiosa* (Cr.)  
   *albicans* (Prov.)  
   *albopillosa* (Fow.)  
   *californica* (Cr.)



edwardsii (Cr.)  
 fowleri (Co.)  
 hirsutior (Co.)  
 iridotes (Co.)  
 intrudens (Cr.)  
 stretchii (Cr.)  
 virgata (Co.)

Xenoglossa angellica Co.  
 angustior—patricia.  
 eucubitorum (not California).  
 davidsoni Co.  
 patricia Co.  
 pruinosa (not California).

## PANURGIDÆ.

Amblyapis illicifoliæ Co.  
 Calliopsis anthidius Fow.  
 albitarsis Cr.  
 atriceps—Panurginus.  
 californicus—Panurginus.  
 cinctus Cr.  
 clypeatus Cr.  
 edwardsii Cr.  
 lateralis—edwardsii Cr.  
 obscurellis Cr.  
 visaliensis Fow.  
 scutellaris Fow.  
 zonalis Cr.  
 Halictoides mulleri Co.  
 saundersi Co.  
 virgatus Co.  
 Panurginus atriceps (Cr.)  
 californicus (Cr.)  
 chalybeus Cr.  
 Panurgus regularis—Parandrena.  
 Parandrena albitarsis—Calliopsis.  
 coccinula Co.

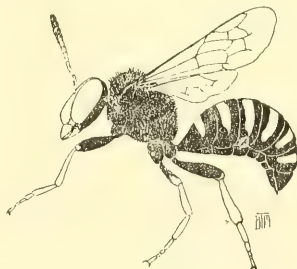


Figure 69. Calliopsis.

enocki Co.  
 eumorpha Co.  
 regularis (Cr.)  
 Perdita californica  
 claypolei Co.  
 interrupta Cr.  
 rhois Co.  
 trisignata Co.

## PROSOPIDÆ.

These bees carry the pollen to their nests in the honey sac and store it with a greater proportion of honey than usual. A few are parasitic.

Prosopis bakeri—rudbeckiæ.  
 basalis Sm.  
 calvus Metz.  
 coloradensis Co.  
 conspicua Metz.  
 coquilletti—episcopalis.  
 cressoni Co.  
 episcopalis Co.  
 mesillæ—cressoni.  
 nevadensis Co.  
 passadenæ—cressoni.  
 polifelli Co.  
 rudbeckæ C.&S.  
 COLLETIDÆ.



Figure 70. Prosopis.

tridentulus Co.

These little bees live in burrows in the ground which they line with a conspicuous slimy secretion.

Colletes americanus Cr.  
 clypeonitens SW.

ochraceus SW.

**ANDRENIDÆ.**

The Andrenidæ are among the smallest of the bees. They are often semi-social, many living in a common burrow but within which each maintains its own quarters.

**SYNOPSIS OF GENERA.**

**Halictus:** color not metallic **Andrena:** basal vein bent.

**Agapostemon. Augochlora:** second recurrent from third submarginal cell.



Figure 71. *Andrena*.

**Agapostemon femoratus** Craw.  
texanus Cr.

**Andrena chalybea** (Cr.)

foxii Co.  
griseonigra Co  
hesperidus Cr.  
knuthiana Co.

perimelas Co.  
pertristis Co.  
phenax Co.  
stanfordiana Co.  
subtristis Co.

**Auglochora pura** (Say).

**Chloralictus incompletus**—**Halictus.**  
nevadensis—**Halictus.**

punctativentris—**Halictus.**

**Conanthalictus bakeri**—**Halictus.**

**Evylaeus latifrons**—**Halictus.**

nigrescens—**Halictus.**

robusta—**Halictus.**

**Halictus bakeri** Cra.

farinosus Sm.

gracilis Rob.

incompletus Cra.

latifrons Cra.

longicornis Cra.

mellipes Cra.

nevadensis Cra.

nigriceps Cra.

punctativentris Cra.

purus—**Augochlora.**

robusta Cra.

**Nomia nevadensis** Cr.

tegularis Rob.

**Panurgus chalybea**—**Andrena.**

**SPHECINA.****PHILANTHIDÆ.**

**Aphilanthops elsiæ** Dun.

foxi Dun.

**Cerceris æqualis** Prov.

californicus Cr.

cockerelli Vier.

flavocinctus—**Eucerceris.**

**Eucerceris flavocinctus** (Cr.)

insignis Prov.

**Philanthus californicus** Cr.

crabiformis Sm.

subsimilis Cr.

**STIZIDÆ**

specius—**Stizus.**

**Ammatomus noneduloides** (Pack.)

**Gorytes monoduloides**—**Ammatomus.**

**Sphecius convallis**—**speciosus.**

speciosus Drury.

**Hoplisoides umbonatus** Cam.

**Hypomellinus flavicinctis** Cam.

**Sphex speciosus**—**Sphecius.**

*Stizus flavus* Cam.  
*godmani* Cam.

unicinctus—*Stizoides*.  
*Stizoides unicinctus* (Say.)

## OXYBELIDÆ.

*Oxybelus impatiens*—*quadrinotatus*.

*quadrinotatus* Say.

## NYSSONIDÆ

*Astata bella* Cr.  
*cærulans* Cr.

*nevadicus* Cr.  
*nubeculus* Cr.

## SPHEGIDÆ.

This family includes the mud daubers, *Sceliphron* and *Chlorion*, which store their nests with spiders, others capture caterpillars, grasshoppers, etc.

*Ammophila argentifrons*--*Psammophila* *Prionyx atratum*—*Chlorion*.

*luctuosa*—*Psammophila*.

*sæva*—*Sphex*.

*violaceipennis*—*Psammophila*.

*rightii*—*Sphex*.

*Cloptera wrightii*—*Sphex*.

*Chalybion cæruleum*—*Chlorion* *cyan-*  
*eum*.

*zimmermani*—*Chlorion*.

*Chlorion abdominalis* (Cr.)

*ashmeadii* Fern.

*atratum* (Lep.)

*aztecum* (Saus.)

*bifoviatum* (Tasch.)

*cyaneum* Dahl.

*elegans* (Sm.)

*derrifineum* (Fox).

*læviventris* (Cr.)

*luçæ* (Saus.)

*pensylvanicum* (Linn.)

*præstans* (Kohl.)

*rufiventris* (Cr.)

*thomæ* (Fabr.)

*Isodonta aztecum*—*Chlorion*.

*elegans*—*Chlorion*.

*Palmodes abdominalis*—*Chlorion*.

*læviventris*—*Chlorion*.

*præstans*—*Chlorion*.

*rufiventris*—*Chlorion*.

*Pelopeus cementarius*—*Scelifron*.

*Proterosphex ashmeadii*—*Chlorion*.

*luçæ*—*Chlorion*.

*pensylvanicum*—*Chlorion*.

*Psammaphila argentifrons* (Cr.)

*luctuosa* (Sm.)

*pacifica* Mel.

*violaceipennis* (Lep.)

*Sceliphron cementarius* (Dru.)

*Sphex abdominalis*—*Chlorion*.

*atratum*—*Chlorion*.

*aztecum*—*Chlorion*.

*bifoviatum*—*Chlorion*.

*cæruleum*—*Chlorion* *cyaneum*.

*cementarius*—*Sceliphron*.

*cyaneum*—*Chlorion*.

*elegans*—*Chlorion*.

*ferrugineum*—*Chlorion*.

*læviventris*—*Chlorion*.

*luçæ*—*Chlorion*.

*pensylvanicum*—*Chlorion*.

*placidus* (Sm.)

*præstans*—*Chlorion*.

*rufiventris*—*Chlorion*.

*sæva* (Sm.)

*thomæ*—*Chlorion*.

*wrightii* (Cr.)

## LARRIDÆ

*Ancistroma aurantia* Fox.  
*dolorosa* Fox.

*tenuicornia* Sm.

*Bembidula nigrifrons* (Prov)

*parata* (Prov.)

*ventralis* Say.

Larva *tenuicornis*—*Ancistroma*.

*Lyrops pepticus*—*Tachytes*.

*Microbembex monodonta* (Say).

*Monodula nigrifrons*—*Bembidula*.

*parata*—*Bembidula*.

*pulchella*—*Stictia*.

*pulla*—*Stictia*.

*tenuicornis*—*Stictia*.

*usitata*—*Stictia*.

*Stictia nigrifrons*—*Bembidula*.

parata—*Bembidula*.  
 signata (Linn.).  
 tenuicornis (Fox).  
 usitata (Fox).  
*Tachysphex ashmeadii* Fox.  
 crenulatus Fox.  
 spinosus Fox.  
 spissatus Fox.

pauillatus Fox.  
*Tachytes distinctus* Sm.  
 elongatus—*distinctus*  
 pepticus Say.  
 rufofasciatus Cr.  
*Steniola duplicata* Prov.  
 scolopacea—*duplicata*.  
 tibians Handl.

## BEMBECIDÆ.

*Bembex amœna* Hal.  
 fasciata Fabr.  
 spinolae—*fasciata*.  
 monodonta—*Microbembex*.

nubilipennis Cr.  
 occidentalis Fox.  
 U-scripta Fox.

## PEMPHREDONÆ

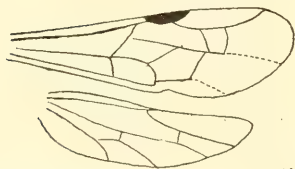


Figure 72. Diagram of the venation of Pemphredonidæ.

*Diodontus occidentalis* Fox.  
*Mimesa mixtus* (Fox).  
*Passalœcus mandibularis* Cr.  
*Pemphredon rileyi* Fox.  
*Psen mixtus*—*Mimesa*.  
*Stigmus coquilletti*—*fulvipes*.  
 fulvipes Fox.

## TRYPOXYLIDÆ

*Trypoxylon californicum* Saus.

tridentatum Pack.

## CRABRONIDÆ

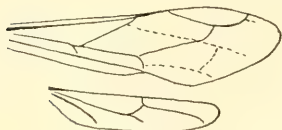


Figure 73. Diagram of the venation of Crabronidæ.

*Clypochrysis gracilissimus* (Pack.)  
 nigrifrons (Cr.)  
*Crabro abdominalis*—*Moniæcera*.  
 asperatus—*Protothyreopus*.  
 dilectus—*Protothyreopus*.  
 gracilissimus—*Clytochrysis nig-*

rifrons.  
 nigrifrons—*Clypochrysis*.  
 packardii—*Hypocrabro*.  
 sexmaculatus—*Xestocrabro*.  
 spiniferus—*Xylocrabro*.  
 vicinus—*Thyreopus*.  
 villosus—*Protothyreopus*.  
*Hypocrabro packardii* (Cr.)  
*Moniæcera abdominalis* (Fox).  
*Protothyreopus dilectus* (Cr.)  
 villosus (Fox).  
*Thyreopus vicinus* (Cr.)  
*Xestocrabro sexmaculatus* (Say).  
*Xylocrabro spiniferus* (Fox).

## VESPINA.

## MUTILLIDÆ.

The females of the Mutillidæ are wingless and are often called woolly ants.



They are unusually abundant in California. Some are parasitic in bumble bee nests but the habits of most of the species are unknown.

*Agama rustica*—Mutilla.

unicolor—Mutilla.

*Brachycistis brevis* Fox.

carinatus Fox.

castaneus (Cr.)

figitiformis Bak.

gaudii Cr.

grabella (Cr.)

inæqualis Fox.

nudus Fox.

rutilans—Cyphotus.

subquadratus Fox.

*Cyphotus californicus* Cam.

elevatus Blake.

heathii Mel.

peculiaris Cr.

piceiceps Cam.

rutilans (Blake.)

similis Cam.

*Sphærophthalma anthophoræ*—Mutilla.

anthracina—Mutilla anthracicolor.

arota—Mutilla.

aureola—Mutilla.

californica—Mutilla.

coccineohirta—Mutilla.

edwardsii—Mutilla.

erudita—Mutilla.

gloriosa—Mutilla.

heterochroa—Mutilla.

magna—Mutilla.

ochracea—Mutilla.

pacifica—Mutilla.

pamosa—Mutilla aureola

progne—Mutilla.

sackenii—Mutilla.

tecta—Mutilla.

testaceiventris—Mutilla gloriosa

venifica—Mutilla.

zenobia—Mutilla.

zephyrtis—Mutilla.

*Glyptemetopia americana* Ash.

*Monochroa unicolor*—Mutilla.

*Mutilla anthophoræ* (Ash.)

anthracicolor Dal.

arota Cr.

athamas Fox.

aureola (Cr.)

californica Rad.

castaneus—Brachycystis.

clytemnestra Fox

coccineohirta Blake.

connectens Cr.

connectens Cr.

edwardsii (Cr.)

elevata—Cyphotus.

erudita—sackenii.

glabrella—Brachycystis.

gloriosa (Saus.)

harpalyce Fox.

heterochroa Fox.

hypermetra Fox.

inconspicua—Odontophotopsis.

inconspicua—Odontophotopsis.

indiginus Cam.

infelix—Odontophotopsis incon-

ingenuus Cam.

spicuos.

magna (Cr.)

venifica (Blake).

nebulosa (Blake).

nigriventris (lower California).

ochracea (Blake).

pacifica (Cr.)

patersonæ Med.

progne Fox.

peculiaris Cr.

testaceiventris (Fox).

unicolor Cr.

scrupea Say.

tecta—gloriosa.

peculiaris—Cyphotus.

progne Blake.

rustica (Blake).

rutilans—Cyphotus.

sackenii Cr.

unicolor Cr.

venifica (Blake).

zenobia (Blake).

zephyrtis (Fox).

*Methoca californica* West.

*Norsyma ashmeadii* Fox.

*Odontophotopsis annulatus* Bak.

cookii Bak.

exogyous Vier.

inconspicuos (Blake).

ocellatus Bak.

succineus Vier.

*Photopsis abstrusa* Cam.

difficilis Cam.

inconspicuos—Odontophotopsis.

lingulatus Vier.

insignis Cam.

nebulosa—Mutilla.  
 nudata Cam.  
 pedatus Cam.

rústica—Mutilla.  
 unicolor—Mutilla.

## THINNIDÆ

The sexes are extremely unlike in this group.

Glyphometopa americana Ash.  
 Tetepromyia anthracina Ash.

Thonnus californicus Pat.

## TIPHIIDÆ.

Myzina rufiventris—Pterombus.  
 ratiphia—Pterombus Spin.  
 intermedia Cam.

robusta Cam.  
 Pterombus rufiventris (Cr.)  
 Tiphia flavipennis Spin.

## SCOLIIDÆ

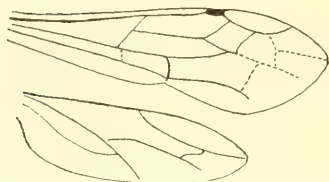


Figure 74. Diagram of the venation of Scoliidæ.

Eus dives Prov.  
 quadricincta Prov.  
 Scolia consors Saus.  
 Trielis xantiani Saus.

## MYZINIDÆ

Myzina frontalis—Plesia.

Plesia frontalis (Cr.)

## SAPYGIDÆ

These insects are supposed to be parasitic on bees.

Eusapyga californica Cr.  
 Sapyga aculeata Cr.  
 angustata—nevadica.  
 californica Cr.

elegans Cr.  
 nevadica Cr.  
 pumila Cr.

## MARSARIDÆ

Euparagia scutellaris Cr.

Pseudomarsaris edwardsii (Cr.)

Marsaris edwardsii—Pseudomarsaris

## CHRYSIDIDÆ.

These insects are able to coil themselves up into a ball, the abdomen being hollowed out beneath to fit closely against the underside of the head and thorax. They are parasitic in the nests of other wasps.

Chrysis alfkenella DuB.  
 californica Gril.  
 coerulans Fabr.  
 densa Cr.  
 dorsalis Aaron.  
 halictula Gril.

hilaris Dahl.  
 inflata Aaron.  
 intricata Brul.  
 inusita Aaron.  
 lauta Cr.  
 opyima Aaron.

- |                                 |                                |
|---------------------------------|--------------------------------|
| mucronata—parvula.              | Hedychrum dimidiatum—Holopyga. |
| pacifica Say.                   | sinuosum—Omalus.               |
| parvula Fabr.                   | ventralis—Holopyga.            |
| perpulcra Cr.                   | violaceum Brullé.              |
| propria Aaron.                  | viride—Holopyga.               |
| verticalis Pat.                 | Holochrysis interfota DuB.     |
| Cleptes purpurata Cr.           | Holopyga dimidiatum (Say).     |
| Ellampus marginatus (Pat.)      | ventralis (Say).               |
| nitidus (Aaron).                | viride (Cr.)                   |
| Euchroëus edwardsii—Parnopes.   | Notozus marginatus—Ellampus.   |
| Hedychordum continuum Sr.       | nitidus—Ellampus.              |
| Hedychridium cinereum—Hedychor- | Omalus diversa Aaron.          |
| dum.                            | læviventris Cr.                |
| continuum Aar.                  | sinuosus (Say).                |
| dimidiatum—Holopyga.            | Parnopes edwardsii Cr.         |
| viride—Holopyga.                | Spintharis annulipes Mocs      |

## EUMENIDÆ.

This and the next family fold their front wings when at rest. These are solitary wasps which store caterpillars in their nests.

- |                                  |                                   |
|----------------------------------|-----------------------------------|
| Ancistocerus edwardsii—Odynerus. | cytainus Cam.                     |
| lalophila Vier.                  | cosmiogaster Cam.                 |
| fulvitaris Cam.                  | edwardsii Cam.                    |
| lineativentris Cam.              | fulvitaris Cam.                   |
| rivularis—Odynerus.              | philadelphicæ Saus.               |
| sutterianus—Odynerus.            | pratensis Saus.                   |
| trichiontus Cam.                 | rivularis Cam.                    |
| Eumenes coloradensis Cr.         | scutellaris Saus.                 |
| crucifera Prov.                  | sulfureus Saus.                   |
| Monobia bicolor Prov.            | sutterianus Saus.                 |
| Nortonia nevadensis Cam.         | Pterochilus biplagiatus Cr.       |
| Odynerus blandus Saus.           | Symmorphus philidelphiæ—Odynerus. |
| claremontis Cam.                 |                                   |

## VESPIDÆ.

Paper wasps so named because their nests are made of paper manufactured by the insect. The yellow-jackets have a very similar history to that given for bumble bees. Hornets make their nests above ground and have equally populous colonies.

## SYNOPSIS OF GENERA.

- |   |                                    |
|---|------------------------------------|
| <i>Vespa</i> . Polistes: abdomen only subsessile. | <i>Polybia</i> : abdomen petiolate |
| <i>Polistes</i> anaheimensis—aurifer.             | <i>Vespa</i> diabolica Saus.       |
| aurifer Saus.                                     | germanica Linn.                    |
| minor Beauv.                                      | maculata Fabr.                     |
| navajoe Cr.                                       | occidentalis—germanica.            |
| <i>Polybia</i> flavitaris Saus.                   | sulphurea Saus.                    |

## PSAMOCHARIDÆ.

The tarantula hawks, Pepsis, are the largest members of the order. All of the species of the family are supposed to store their nests with spiders.

- |  |  |
|--|--|
| <i>Agnesia</i> blaisdelii Fox.             | <i>Ceropales</i> . ferrugineus— <i>Arachnopro-</i> |
| <i>Arachnoproctonus</i> ferrugineus (Say.) | tonus.   |

fraterna Sm.  
stretchii Fox.  
Pepsis chrysothemis Luc.  
cinnabarina Luc.  
formosa (Say.)  
hesperia—mildei Stal.  
sommeri Dahl.

Planiceps planatus Fox.  
Pompilius ferrugineus—Arachnoproctonus.  
formosus—Pepsis.  
tenebrosus—Pycnopompilius.  
Pycnopompilius tenebrosus (Cr.)

## FORMICINA.

### FORMICIDÆ.

The ants are of peculiar interest at the present time in California because of the recent introduction and steady spread of the Argentine species, *Iridomyrex humilis*, which is killing off all native ants and proving a very serious annoyance about the house. Already the insect occupies all of Alameda and the greater part of San Jose and College Park, and also large areas in Los Angeles, Berkeley, and Stockton. It is present in numerous other localities.

Ants are social insects with a wingless worker cast and queens that lose their wings after their nuptial flight.

Literature:— California Bulletin 207. Wheeler, Ants.

Aphenogaster paturellis Forel.  
pergandei Mayr.  
Camponotus anthrax Whe.  
fallax Nyl.  
herculeanus Linn.  
hyatti Emery.  
lævigatus Sm.

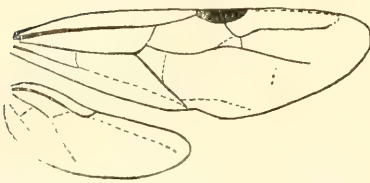


Figure 75. Diagram of the venation of Formicidæ.

maccooki Forel.  
maculatus Fabr.  
Cremastogaster lineolata Say.  
vermiculata Emery.  
Cyphomyrmex wheeleri Forel.  
Dorymyrmex bicolor—pyramicus.  
pyramicus Roger.  
Echiton californicus Mayr.  
Formica pilicornis Emery.  
rufa Linn.  
rufiventris Emery.  
subpolita Mayr.

tejonica Bick.  
Iridomyrex analis And.  
humilis Mayr.  
Leptothorax andrei Emery.  
nitens Emery.  
pergandei And.  
Liometopium apiculatum Mayr.  
microcephalum Panz.  
Messor andrei Mayr.  
pergandei And.  
stodderdi Emery.  
Monomorium ergatogyna—minutum  
minutum Mayr.  
pharionis Linn.  
Myrmecocystis lugubris Whe.  
melliger Forel.  
mexicanus Wesm.  
Myrmica bicarinata. Nyl.  
bradleyi Whe.  
californicus Buck.  
Phiedole barbarata Whe.  
californica Mayr.  
hyatti Emery.  
Neoponera agilis For.  
Pogonomyrmex badius Latr.  
barbatus Sm.  
californicus Buck.  
occidentalis Cr.  
subdentatus Mayr.  
Plenolepis imparis Say.  
Solenopsis aurea Whe.



*geminata* Fabr.  
*texana* Emery.  
*Stenamma bakeri* Whe.  
*brevicornis* Mayr.

*nearcticum* Mayr.  
*patruelis*—*bakeri*.  
*Tapinoma sessile* Say.

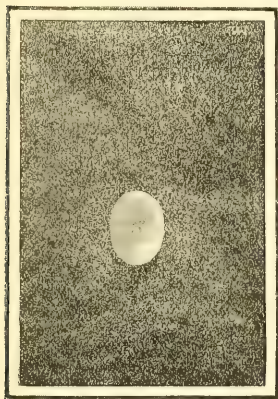
STAGES OF THE ARGENTINE ANT. — *Iridomyrmex humilis*.

Figure 76. The Egg.

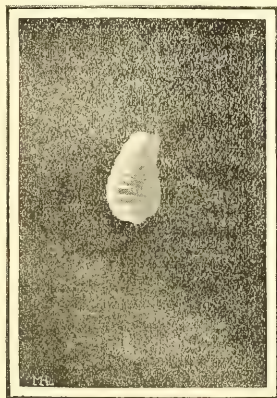


Figure 77. Young larva.



Figure 78. Older larva.

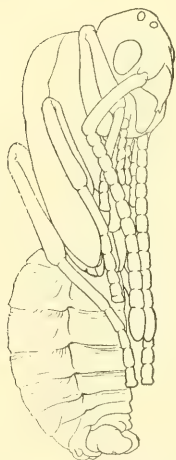


Figure 79. Pupa.

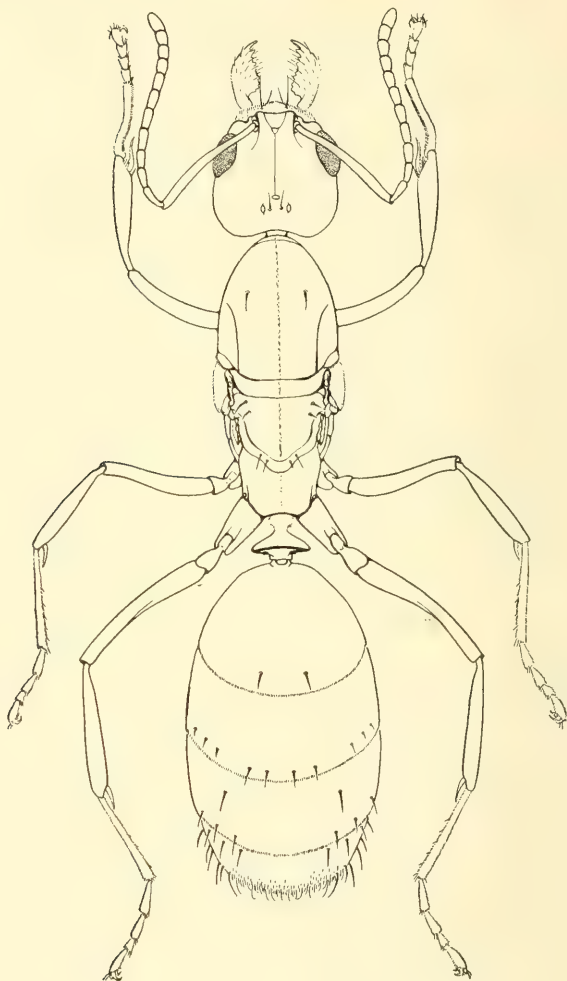


Figure 86. Queen of the Argentine ant, *Trilomyrmex humilis*.

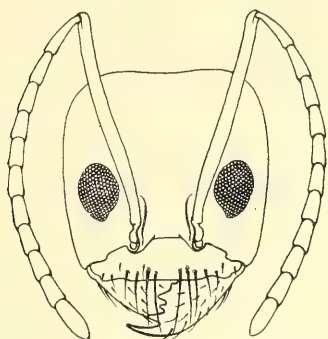


Figure 81. Head of *Dorymyrmex*

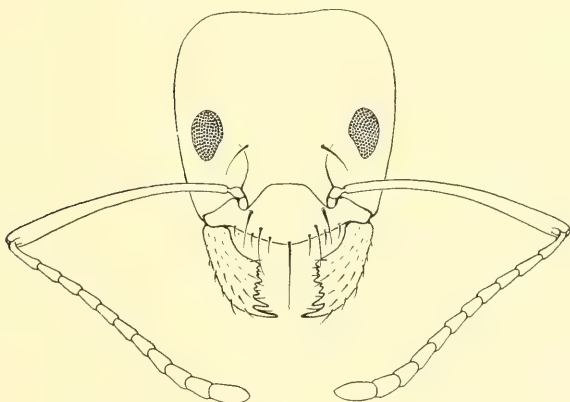


Figure 82 Head of *Iridomyrmex analis*.

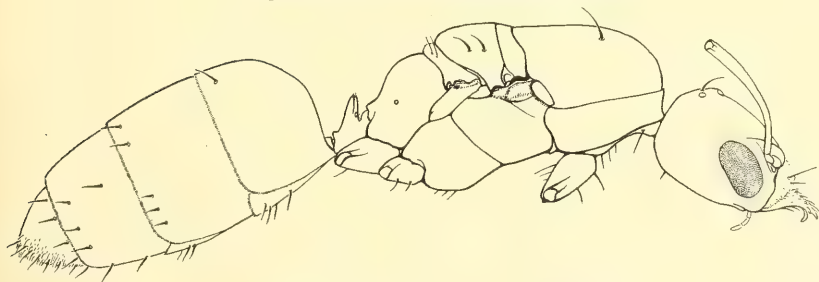
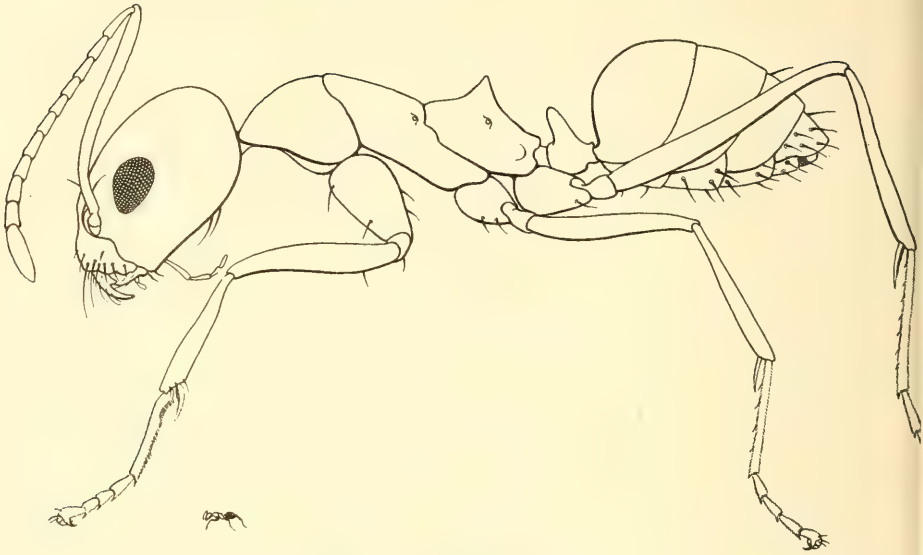
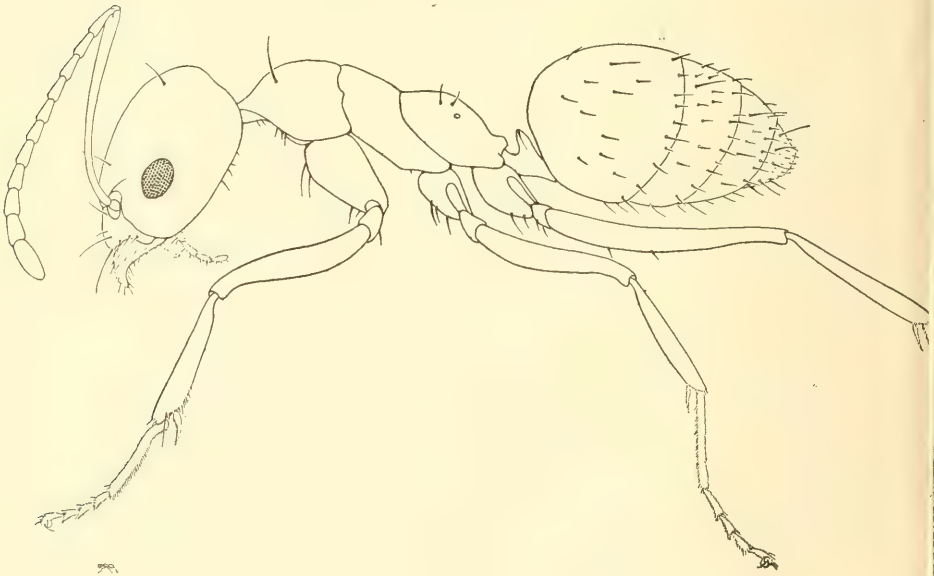


Figure 83 Queen of the Argentine ant.

Figure 84. *Dorymyrmex*.Figure 85 *Iridomyrmex analis*.



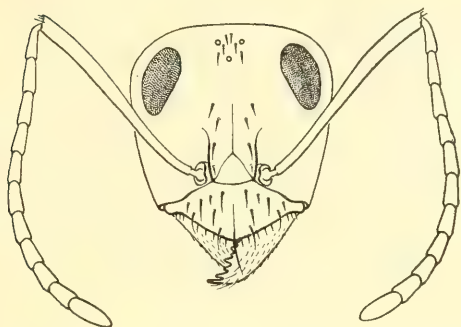


Figure 86. Head of a queen field ant, Formica.

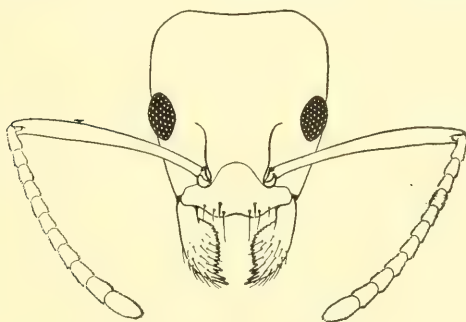


Figure 87. Head of Tapinoma.



Figure 88 Tapinoma.

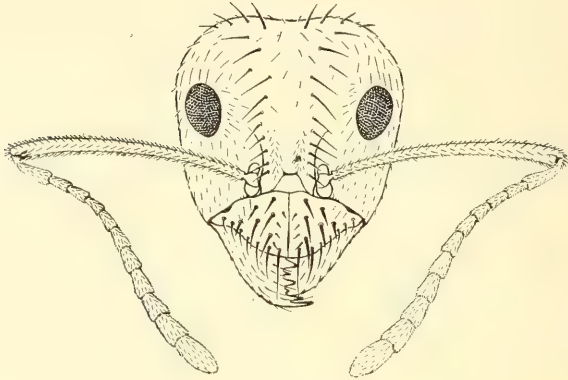


Figure 89. Head of the smaller honey ant, *Prenolepis*.

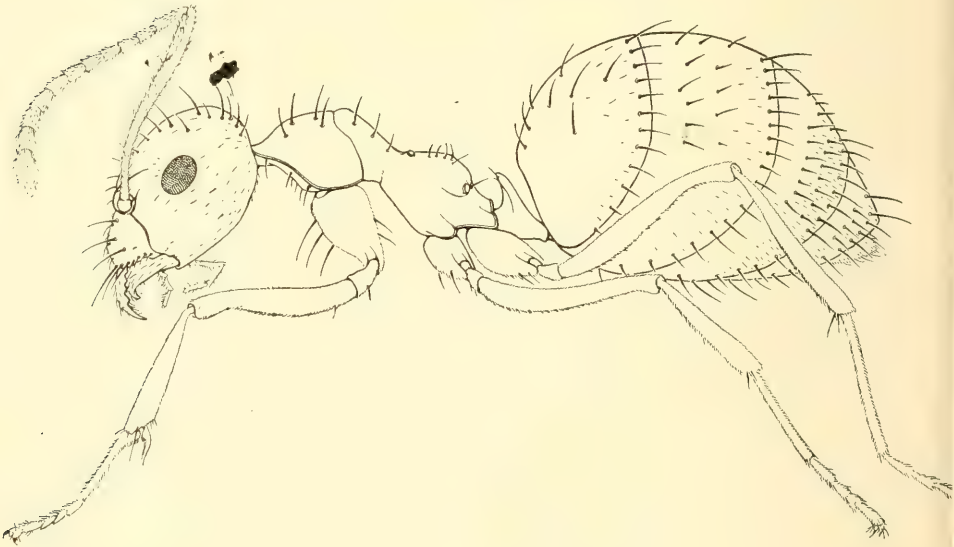


Figure 90. The smaller honey ant.

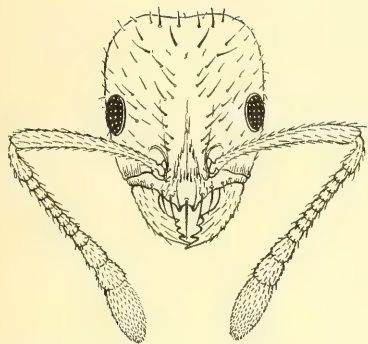


Figure 91 Head of small house ant.  
*Stenamma*.

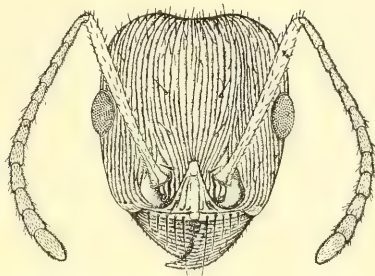


Figure 92. Head of the black harvester  
ant.

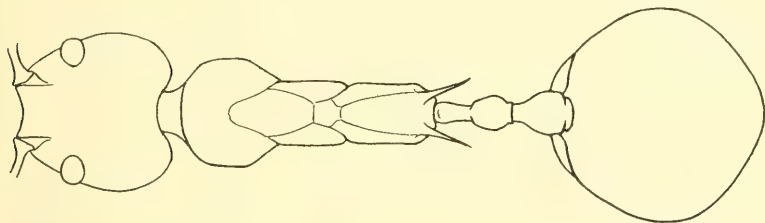


Figure The back of the black harvester ant

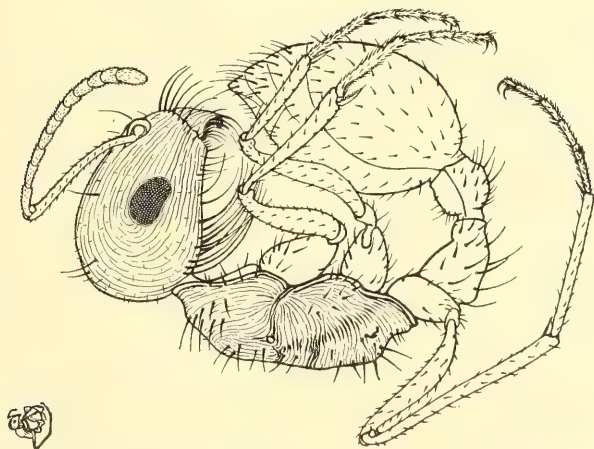


Figure 94. The red harvester ant. *Pogonomyrmex*. Position assumed when  
greatly annoyed.

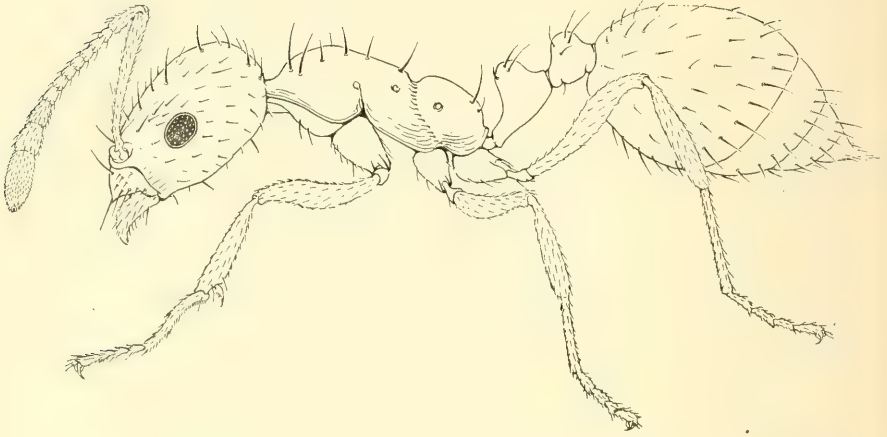


Figure 95. Small house ant, *Monomorium*.

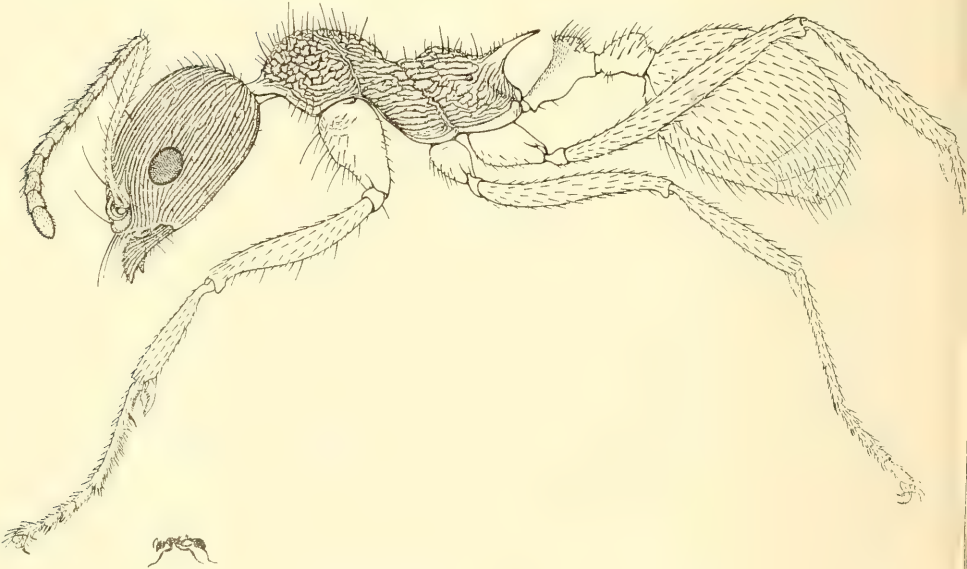


Figure 96. The black harvester ant,





Figure 97. Head of acrobat ant, *Cremastogaster*.

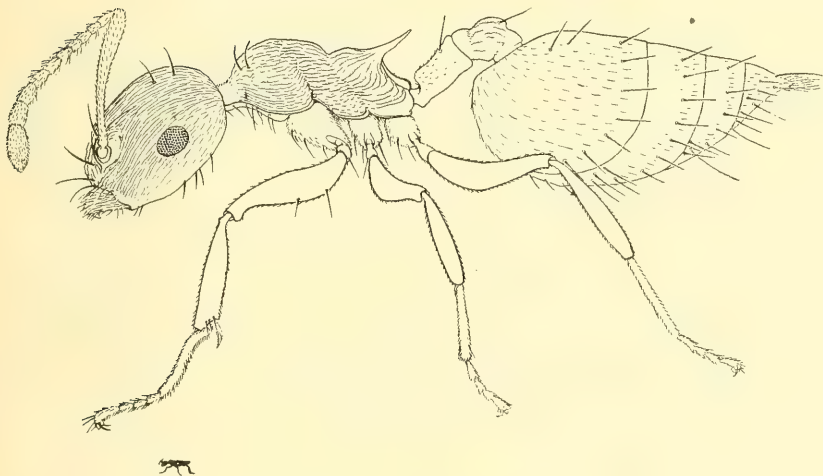


Figure 98. The acrobat ant..

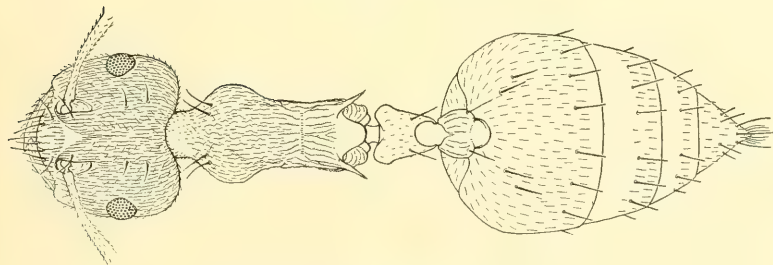


Figure 99. The back of the acrobat ant.

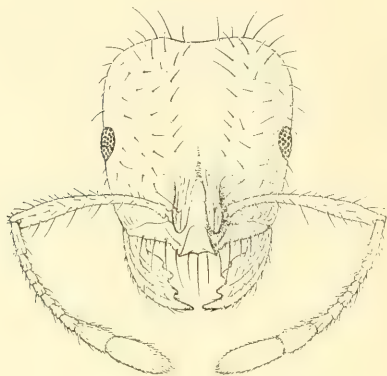


Figure 100. Head of the fire ant, *Solenopsis*.

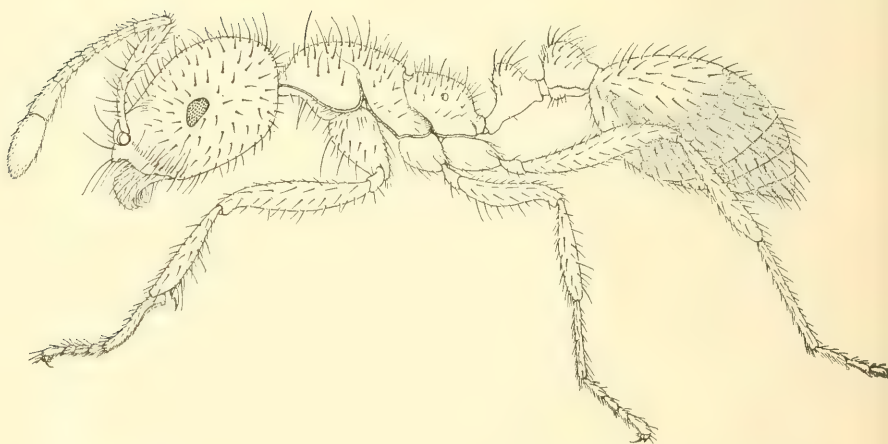


Figure 101. The fire ant.

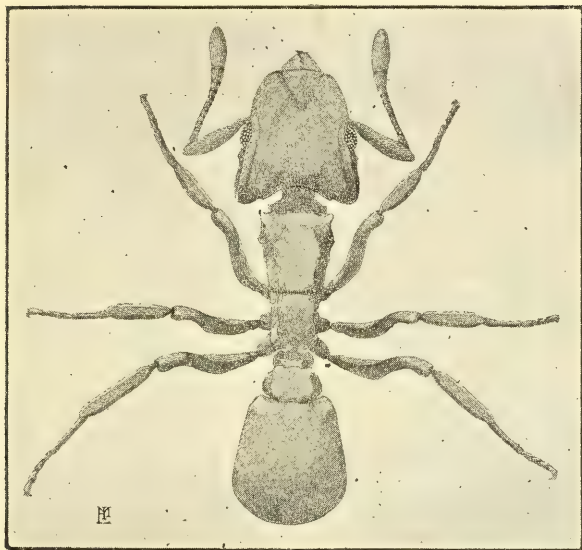
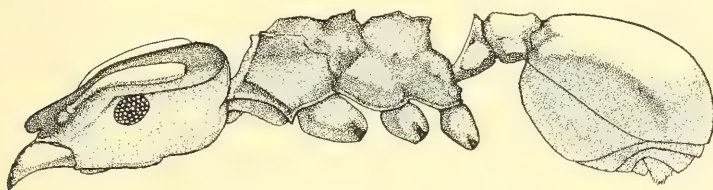
Figure 102. The fungus ant, *Cyphomyr*

Figure 103. Side view of the fungus ant.

*CHALCIDINA.**EULOPHIDÆ.*

*Aphelinus diaspidis* How.  
*flaviceps* How.  
*fuscipennis* How.  
*mytilaspidis* Leb.

*Aspidiotiphagus citrinus* (Craw).

*Coccophagus aurantii*—*Prospalta*.  
*californicus* How.  
*citrinus*—*Aspidiotiphagus*.  
*flavoscutellum* Ash.  
*lecanii* Fitch.



Figure 104. *Aphelinus diaspidis*.

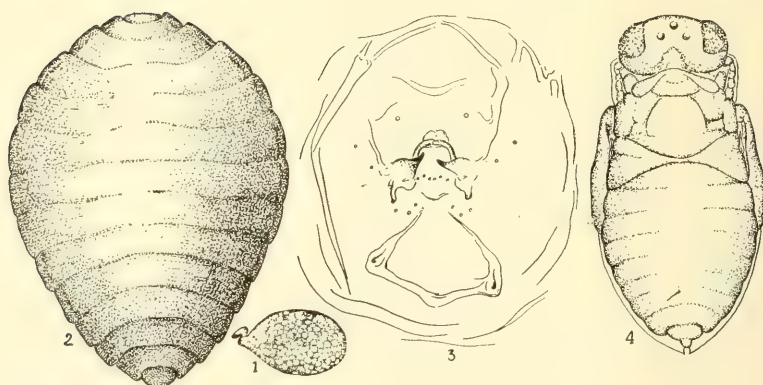


Figure 105. *Aphelinus diaspidis*. 1. egg. 2. larva. 3. head segment. 4. pupa.



Figure 106. *Aspidiotiphagus citrinus*.

*lunatus* How.  
*ochraceus* How.  
*scutatus* How.  
*Encarsia angelica* How.  
*coquilletti* How.  
*Eretmocerus californicus* How.

*Gyrolasia flavimedia*—*Pteropteryx*.  
*Prospalta aurantei* (How.)  
*Prospeltella gelatinosus* Horn.  
*quericola* How.  
*Pteropteryx flavimedia* (How.)  
*Tetrastichus californicus* Ash.

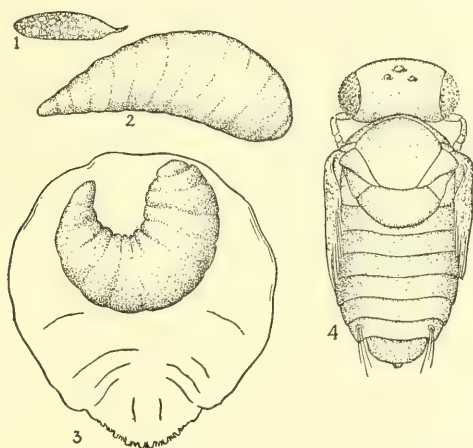


Figure 107. *Aspidiotiphagus citrinus*. 1. egg. 2. larva. 3. larva in yellow scale. 4. pupa.

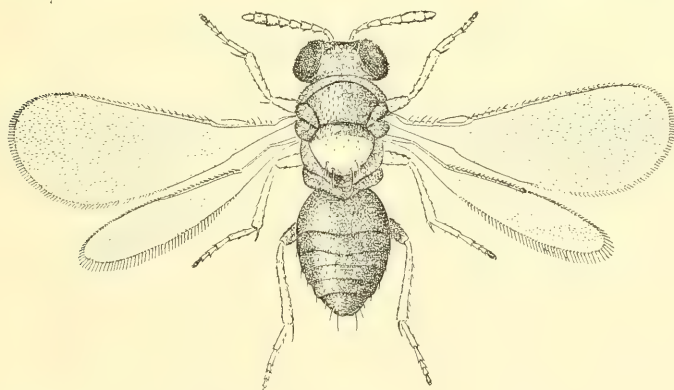


Figure 108. *Coccophagus lunatus*.

#### CLEONIDÆ.

*Enchrysia hyalipennis* Ash.

*maculipennis* Ash.



## PTEROMALIDÆ.

*Epsitemia odayneri*  
*Halizoa rufipes* Ash.

*Isocratus vulgaris*  
*Metapon californicum* Ash.

## ENCYRTIDÆ.



Figure 109. *Aphycus flavus*.



Figure 120. Soft brown scale with exit holes of *Aphycus flavus*.

*Bothriothorax californicus* How.  
*Aphycus angelicus* How.  
*californicus* How.  
*coquilletti* How.  
*fiscipennis* How.

*flavus* How.  
*immaculatus* Hiw.  
*lecanii* How.  
*nigritulus* How.  
*Blastotrix yuccæ* Con

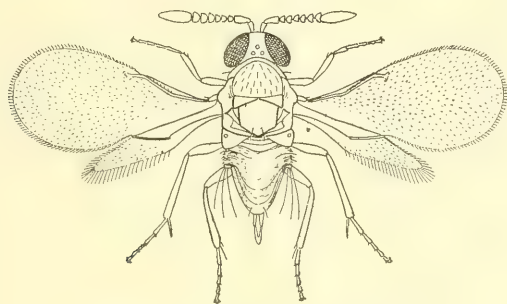


Figure 121 *Aphycus immaculatus*.



Figure 122. *Comys fusca*.

*nigripes* How.  
*planifrons* How.  
*rotundatus* How.  
*Calogaster longiventris* Ash.  
*Cerchysius hubbardi* Ash.  
*Chrysoplatocerus splendens* How.

*Comys fusca* How.  
*Encyrtus dubius*—*Microterys*.  
*flavus*—*Microterys*.  
*Isodromus iceryæ* How.  
*Microterys dubius* (How.)

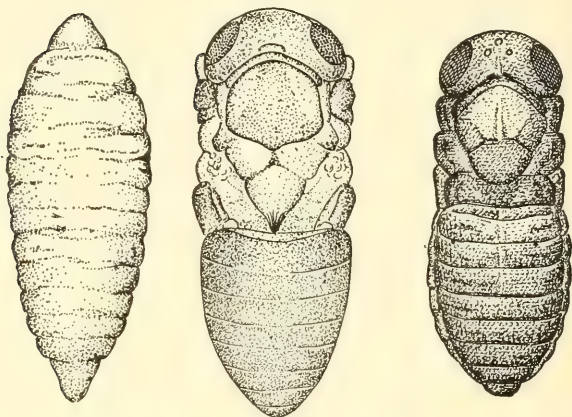


Figure 123 larva of *Comys fusca*, pupa of *Comys fusca* and pupa of *Coccophagus lunatus*.

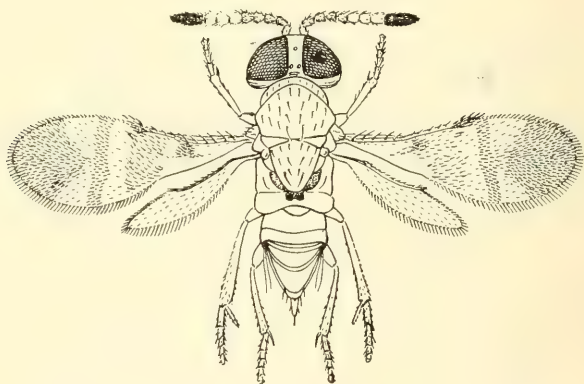
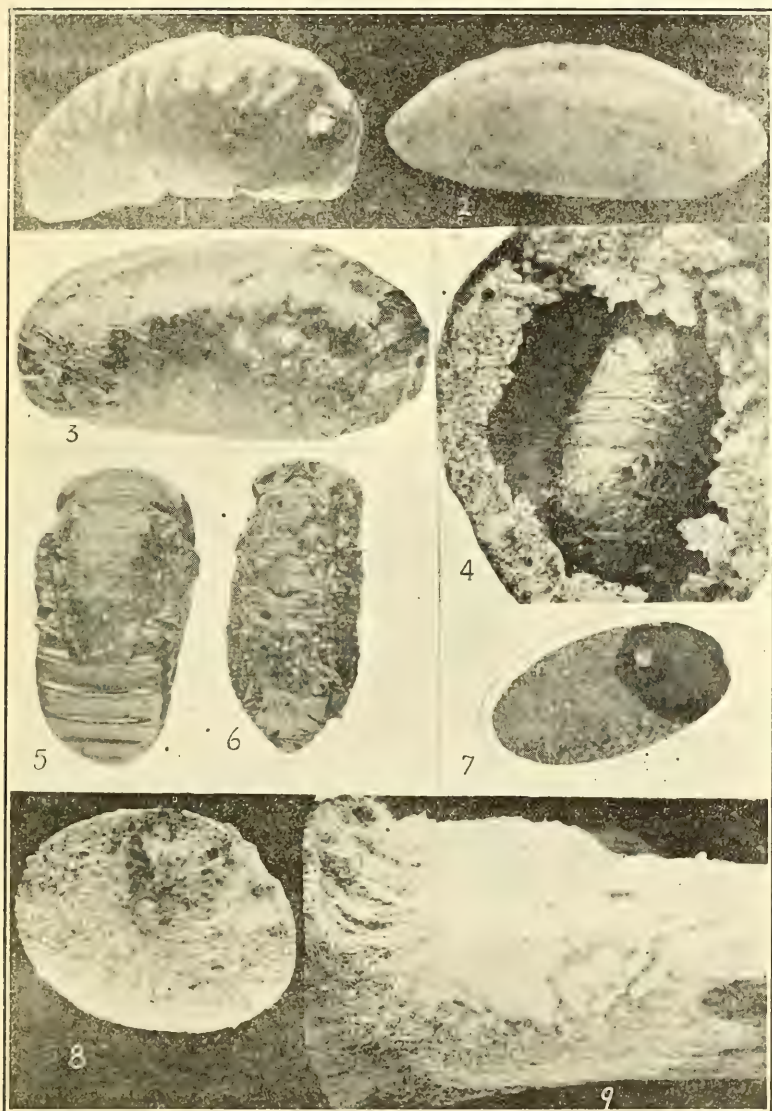


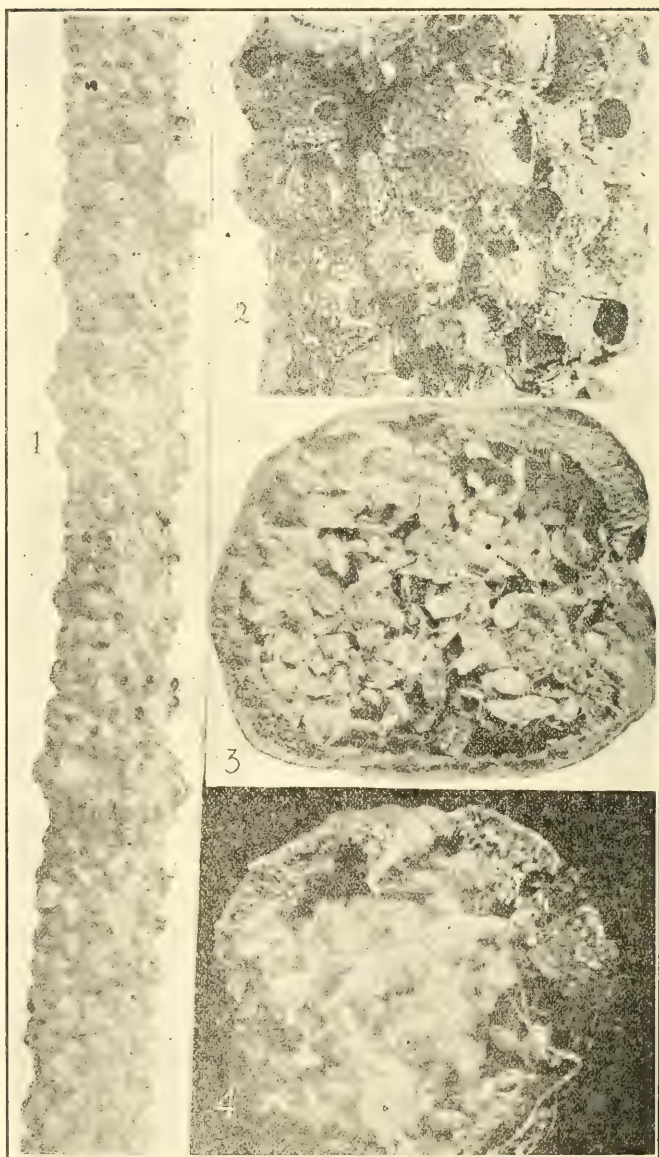
Figure 124. *Microterys flavus*.

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Figure 125. (Opposite page.) Hyperparasite of *Scutellista*. 2. the same changing to pupa. 3. *Scutellista* larva containing hyperparasite the same beneath the scale. 5. normal pupa of *Scutellista*. 6. parasitized pupa. 7. exit hole of parasite in old larva skin of *scutellista*. 8. black scale killed by a fungus, *Isaria*. 9. fungus covering scale and spreading over twig.









*flavus* (How.)  
*Physcus varicornis* How.  
*Tineobius californicus* Ash.  
*coquilletti* Ash.  
*occidentalis* How.

*Tanaostigmodes howardii* Ash.  
*tychii* Ash.  
*Rhipodens citrinus* How.  
*Signiphora australiensis* Ash.  
*Prospalta aurantii* How.

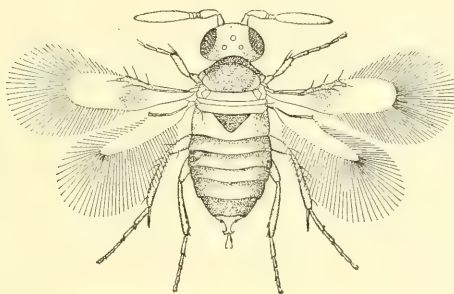


Figure 127. *Signiphora occidentalis*.

#### FIGITIDÆ.

*Eucoila minor* Prov.

#### MISCOGASTERIDÆ.



Figure 128. *Dilophogaster californica*.

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Figure 126. (Opposite page.) 1. black scale with exit holes of *Scutellista*. 2. the same more enlarged. 3. young black scale which died without emerging from the parent scale. 4. eggs and young scale killed by fungus, *Isaria*.

*Brasema ruficollis* Cam.  
*Dilophogaster californica* (How.)

*Semiotellus destructor* How.  
*Tomocerus californicus*—*Dilophogaster*

## EUCHARIDÆ.

*Chalcura californica* Ash.  
*Lophyricea apicalis* Ash.

*Orasema occidentalis* Ash.

## EURYTOMIDÆ.

This family comprises the only group of injurious Chalcidina. The members of the principal genus, *Isotoma*, are known as joint worms. They feed as larvæ in the stems of wheat and other grasses.

*Decatomidea cooke* How.  
*Eurytoma californica* Ash.  
     *tritici*—*Isotoma*.  
*Isotoma agrostidis* How.  
     *bromicola* How.  
     *californicus* How.  
     *grandæ* Ril.

*hirtifrons* How.  
     *tritici* Fitch.  
*Orasema occidentalis* Ash.  
     TORYMIDÆ.  
     *Megastigmus pinus* Par.  
     *Monodontomerus montivagus* Ash.  
     *Syntomaspis californica* Ash.

## AGAONIDÆ.

The one species of this family was imported a few years ago to fertilize the smyrna fig which previously would not bear fruit. The pollen is produced in the capra variety, and in the figs of that variety the insect comes to maturity. The male is wingless and remains within the fig within which it was born. The female after being fertilized, escapes and carries the pollen with which she is dusted to a young fig, fertilizing it.

*Blastophaga grossorum* Grav.

## MYMARIDÆ.

*Anaphes cinctiventris* Gir.

*Gonatocerus californicus* Gir.

## PROCTOTRYPINA.

## PROCTOTRYPIDÆ.

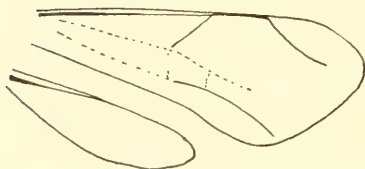


Figure 129. Diagram of the venation of *Proctotrypidæ*.

*Acerota cecidomyidæ* Ash.  
*Aclista californica* Ash.  
     *rufescens* Ash.  
*Alapatus eriococci* Ash.  
*Amblyaspls californicus* Ash.

*Ampulicomorpha confusa* Ash.  
*Anectata californica* Ash.  
*Balays californica* Ash.  
*Ceraphron californicus* Ash.  
     *salicicola* Ash.  
*Cinetus californicus* Ash.  
     *colon* Ash.  
     *muscæ* Ash.  
*Dissomphalis californicus* Ash.  
*Epyris longicollis* Kief.  
     *occidentalis* Ash.  
     *megacephalis* Ash.  
*Gonatopus californicus* Ash.  
*Goniocus cellularis* Say.

*Hadronotus largi* Ash.  
*Hemilexus californica* Ash.  
*Inostemma californica* Ash.  
*Loxotropa californica* Ash.  
*Lygocerus californicus* Ash.  
     *niger* How.  
     *pacificus* As.  
*Negaspilus californicus* Ash.  
*Nesitus californicus* Ash.  
*Pantoclis californica* Ash.  
     *montana* Ash.  
*Paramesius pallidus* Ash.  
*Pentacantha rufitarsis* Kief.  
*Phænipria montana* Ash.  
*Polygnotus atriplicis* Ash.  
     *artemisæ* Ash.  
     *californicus* Ash.  
     *eurotiæ* Ash.

*hauchucæ* Ash.  
     *salicicola* Ash.  
     *striaticeps* Ash.  
*Polymecus lupina* Ash.  
*Proctotrupes californicus* Ash.  
     *caudatus* Say.  
     *pallidus* Say.  
*Prosocantha californica* Ash.  
*Sparasion pacificum* Ash.  
*Telemonus californicus* Ash.  
     *clisiocampæ* Ash.  
     *gnophælae* Ash.  
     *koebelei* Ash.  
*Thoron opacus* Ash.  
*Trichopria pacifica* Ash.  
*Trichostereis floridanus* Ash.  
*Zelotypa ashmeadi* Metz.  
*Zygota californica* Ash.

## PELECINIDÆ.

*Pelicanus polyturator* Dru.

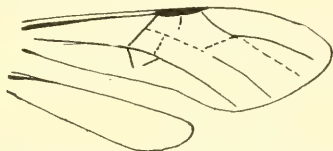


Figure 130. Diagram of the venation of Peleciniidæ.

## ICHNEUMONINA.

## EVANIIDÆ.

*Aulacus editus*—*Odontaulacus*.  
     *rufitarsis*—*Odontaulicus*.  
*Evania californicus*—*Evaniella*.  
*Evaniella californica* Ash.  
*Fœnus occidentalis* Cr.  
     *rubrofasciatus* Kief.  
     *visaliæ* Brad.  
*Gasteruption pattersonæ* M. & B.  
     *pyrrhosternum* Kief.  
     *rubrufasciatum* Kief.  
*Hyptia fulchi* Ash.  
*Odontaulacus editus* Cr.  
     *rufitarsis* Cr.

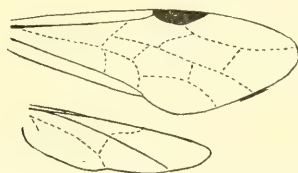


Figure 131. Diagram of the venation of Evaniidæ.

*Pristaulacus fuscus* Brad.

## ICHNEUMONIDÆ.

*Agrypon puparum* Ash.  
*Amblyteles montanus* Cr.  
     *subfuscus* Cr.  
*Anderis californicus* Cr.  
*Anomalon californicum* Cr.  
     *eurekæ* Ash.  
     *maceratum* Cr.

*simile* Ash.  
     *verbosum* Cr.  
     *xanthopis* Ash.  
*Aperileptus tropicus* Day.  
*Atmetus californicus* Ash.  
*Bassus cinctus* Cr.  
     *cinctulus*—*orbitalis*.

decoratus—Homotropus.  
 euuræ—Holmgrenia.  
 humeralis—Homotropus.  
 maculifrons—Syrphoctonus.  
 orbitalis Ash.  
 pacificus—Syrphoctonus.  
 pleuralis—Syrphoctonus.  
 syrphicola Ash.  
 xanthopsis—Syrphoctonus  
     cificus.  
     purgatum Say.  
 Brepactonus californicus Ash.  
 Campoplex assitus Nort.  
 Corinaeus californicus—carinatus.  
     carinatus (Cr.)  
 Campsocyrtus brevicornis Cam.  
 Charops fuscipennis Prov.  
 Clepsiorthus subiginosus (Cr.)  
 Cremnoides californicus (Ash.)  
     tuberculatus Ash.  
 Cryptus alamedensis Ash.



Figure 132. Diagram of the venation of Ichneumonidae.

californicus Ash.  
 callipterus Say.  
 crotchii Cr.  
 dirus Cr.  
 edwardsii Cr.  
 ferrugineus Ash.  
 pacificus Cr.  
 perplexus Cr.  
 proximus Cr.  
 punicus Cr.  
 purpuripennis Cr.  
 resolutus Cr.  
 tejonensis Cr.  
 turbatus Cr.  
 Cteniscus californicus Cr.  
     excelsus—Exyston.  
 Enytus maculipes Cam.  
 Epachthes basilicus Dav.  
 Eremotylus arctiæ Ash.  
 Eriborus triannulatus Cam.  
 Erromenus crassus (Cr.)  
     glabrosus Dav.  
     obscurus—Monoblastus.

Euchrysia hyalinipennis Ash.  
     maculipennis Ash.  
 Eupalmus piceus Ril.  
 Eurythrocyrtus rufus Cam.  
 Exetastus maurus Cr.  
     zelotypus Cr.  
 Exachus atricoxalis—Exochus  
     lævis—Netacælus.  
 pa- Exochilum acronyctæ Ash.  
     glabrosus Dav.  
     occidentalis Cr.  
 Exochys atricoxalis Cr.  
     glabrosus Dav.  
 Exotylus gelechiæ Ash.  
 Exyston excelsus (Cr.)  
     politus Dav.  
 Glypta californica Prov.  
     macra Cr.  
 Grotea californica Cr.  
 Hemiteles annulatus  
     ashmeadii Ril.  
     coleophoræ Ash.  
     meliteæ Ash.  
 Bæthus alaingens Dav.  
     variegatus Ash.  
 Heteropelma longipes Prov.  
 Holmgrenia euuræ (As.h)  
 Homotropus decoratus (Cr.)  
     humeralis (Prov.)  
 Ichneumon astutus—Holm.  
     californicus—rufiventris.  
     clairmontis Cam.  
     crudosus Cr.  
     cupitus Cr.  
     curvator—Triclistus.  
     difficilis Cr.  
     infractus Cr.  
     leucopsis Ash.  
     longulus Cr.  
     neutralis Cr.  
     nuncius Cr.  
     odiosus Cr.  
     petulcus Cr.  
     purpuripennis Cr.  
     rufiventris Br.  
     semisissis Cr.  
     variegatus Cr.  
 Ictoplectis orgyiæ Ash.  
 Ischyrocnemis pacificus Ash.  
 Itaplectus orgyiæ Ash.  
 Lampronota hilaris Cr.  
     occidentalis Cr.  
 Limneria californica Cr.  
     cupressi Ash.  
     eureka Ash.

- |                                    |                                    |
|------------------------------------|------------------------------------|
| fugitiva Say.                      | Æthophorus stretchii Cr.           |
| nolæ Ash.                          | Ophion arctiæ Ril.                 |
| pterophoræ Ash.                    | palmaris Dav.                      |
| tibiator Cr.                       | costale Cr.                        |
| Limnoceras edwardsii Cr.           | emarginatus—Tapinops.              |
| Mesochorus iridescent Cr.          | nigriceps                          |
| Mesoleius rubiginosus—Clepsiorthus | Orona petiolaris Cam.              |
| scapularis (Cr.)                   | Orthocentris californicus—Tapinops |
| stretchii—Æthophorus.              | emarginatus.                       |

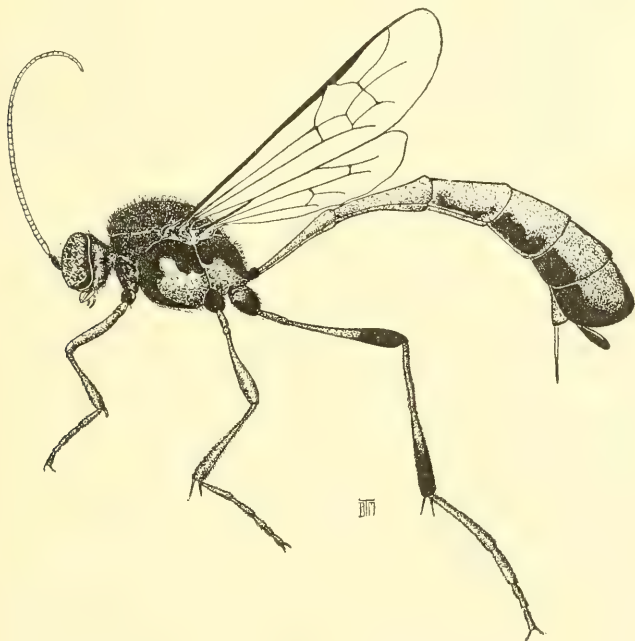


Figure 133. An Ichneumon fly.

- |                                  |                               |
|----------------------------------|-------------------------------|
| submarginatus (Cr.)              | Orthopelma californicum Ash.  |
| Mesotenus gracilipes Cr.         | Otacustes nigroornatus Cam.   |
| Mesochorus iridescent Cr.        | Orthoporus innumerabilis Dav. |
| Mesoleptus scapularis—Mesoleius. | Pezomachus californicus Ash.  |
| Metapodius montanus Cr.          | niger Prov.                   |
| Metacocœlus lævis (Cr.)          | Phygadion albirictus Cr.      |
| Metapon californicus Ash.        | californicus Cr.              |
| Metapodius montanus Cr.          | crassipes Rov.                |
| Monoblastus obscurellus (Cr.)    | fulvescens Cr.                |
| Monoblastus obscurellus (Cr.)    | litamus Cr.                   |
| Næmon californicus (Cr.)         | phryganidiæ Ash.              |
| lusoris (Cr.)                    | Phytodictus californicus Cr.  |



obscurellus Cr.  
*Pimpla annulipes* Brul.  
*aplopappi* Ash.  
*behrensii* Cr.  
*brunneifrons* Vier.  
*conquisitor* Say.  
*erythropus* Vier.  
*lithocolletidis* Ash.  
*notanda* Cr.  
*orgyæ* Ril.  
*pterochori* Ash.  
*rubropectus* Cr.  
*Polyblastus pedalis* (Cr.)  
*Polysphincta koebelei* How.  
*Platylabus californicus* Cr.  
*consors* Cr.  
*Porizon californica* Prov.  
*Pristomerus pacificus* Cr.

*Stenomacris hastatus* Dav.  
*Syrphoctonus maculifrons* Co.  
*pacificus* Cr.  
*pleuralis* (Cr.)  
*Stiboscopus erithrostomus* Cam.  
*Tapinops emarginatus* (Say).  
*Thibetoides flosimoris* Dav.  
*Triclistus curvator* Fabr.  
*Triphon californicus*—Næmon.  
*carinatus*—*Chlorinasus*.  
*communis* Cr.  
*lusorius*—Næmon.  
*pedalis*—*Polyblastus*.  
*submarginatus*—*Mesoleius*.  
*subniger* Cr.  
*tejonicus*—*Syrphoctonus crassus*  
*Xylonomus californicus* Cr.  
*Zaglyptus koebelei*—*Polysphincta*.

*Schletterius cinctipæ* (Cr.)

#### STEPHANIDÆ.

*Stephanis cinctipæ*—*Schlettarius*.

*Adelura subcompresa* Ash.  
*Alysia fossulata* Prov.

#### ALYSIIDÆ.

*Aphæreta californica* Ash.

#### BRACHONIDÆ.

*Apanteles koebelei* Ril.  
*Aphidaria basilaris* Prov.  
*Aphidus californicus* Ash.  
*confusus* Ash.  
*lachni* Ash.  
*nigrovarius* Prov.  
*Blacus atricornis* Ash.  
*orchesiæ* Ash.  
*californicus* Ril.  
*cecidomyiæ* Ash.  
*Bracon angelicus* Prov.  
*atripectus* Ash.  
*euuræ* Ash.  
*juglandis* Ash.  
*koebelei* Ash.  
*nevadensis* Ash.  
*politus* Prov.  
*sanguineus* Prov.  
*xanthonotus* Ash.  
*Cænophanes koebelei*  
*Chelonus fissus* Prov.  
*irridescens* Cr.  
*nanus* Prov.  
*Eubadizon californicus* Prov.  
*Ganychorus atricornis* Ash.  
*orchesiæ* Ash.  
*Heterospilis koebelei* Ash.  
*Lipoplexus chenipodiaphidis* Ash.  
*piceus* Ash.

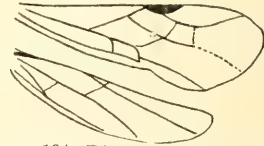


Figure 134. Diagram of the venation of Brachonidæ.

*rapæ* Curt.  
*salicaphidis* Ash.  
*Lisiphlebus abutilaphidis* Ash.  
*baccharaphidis* Ash.  
*citraphis* Ash.  
*coquilletti* Ash.  
*eragrostaphidis* Ash.  
*persicaphidis* Ash.  
*piceiventris* Ash.  
*Macrocentris aciculatus* Prov.  
*Meteorus coquilletti* Ash.  
*Microdus bicolor* Prov.  
*Perilitis coquilletti*—*Meteorus*.  
*Proterops californicus* Ash.  
*Enogus ceruræ* Ash.  
*Rhyssalus californicus* Ash.  
*Spathius sequoiæ* Ash.  
*pluto* Ash.  
*Toxoneurus californica* Ash.

## CYNIPINA.

## CYNIPIDÆ.

This family comprises gall making insects and their guests (inquilines).

The food plants are **Rubus** *Diastrophus*, **Rosa** *Rholites* and *Lytorhodites*, **Quercus** all other species. The oak galls occur on various parts of the tree as follows:— **roots** *Callirhytis*, **twigs** *Disholcaspis*, *Cynips* all species except *maculipennis*, *Andricus quercuscalifornicus*, *dasydactyli* and *wisliceni*, *Callirhytis*, *chrysolepidicola*, *quercuspomiformis*, *quercussuttoni*, *nigra* and *santæclaræ*. **staminate flowers** *Diplolepis dubiosa* and *Andricus congregatus*. **buds** *Andricus pacificus* and *viltzæ* *Callirhytis maculipennis*, *eriphora*, *clarimontis*, *bakeri* and *rossi*. **leaves** all other species. The inquilines are known chiefly on the galls of *Holcaspis eldoradensis* and *Callirhytis quercuspomiformis*.

**Andricus chrysolepidis** Ash.

*agrifoliæ*—*Callirhytis quercusagrifoliæ*.

*apicalis*—*Callirhytis*.

*brunneus* Ful.

*californicus* (Bas.)

*chincopin* (Fitch).

*chrysolepidis* Ash.

*chrysellinus* Bas.

*congregatus* Ash.

*crystallinus* Bass.

*dasodactyli* Ash.

*kingi* Ash.

*kingi* Bas.

*pacificus* Ash.

*parvula* Bas.

*pattersonæ* Ful.

*pompiformis* (Bas.)

*quercusagrifoliæ*—*Callirhytis*.

*quercus californicus* (Bas.)

*quercusflocci* (Walsh.)

*quercuspomiformis*—*Callirhytis*.

*quercussuttoni*—*Callirhytis*.

*speciosus* Bas.

*suttonii*—*Callirhytis*.

*viltzæ* Ful.

*wisliceni* Ash.

*Biorhiza californica* Beut.

*Callirhytis agrifoliæ* (Bas.)

*Callirhytis apicalis* (Ash.)

*bakeri* Kief.

*clarimontis* Kief.

*chrysolepidicola* (Ash.)

*eriphora* Kief.

*eriphora* Kief.

*guadaloupensis* Ful.

*lasia* Ash.

*maculipennis* Kief.

*nigra* Ful.

*polythra* Kief.

*pomiformis*—*quercuspomiformis*.

*quercusagrifoliæ* (Bas.)

*quercuscalifornicus*—*Andricus*.

*quercuspomiformis* (Bas.)

*quercussuttoni* (Bas.)

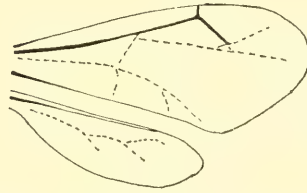


Figure 135. Diagram of the venation of *Cynipina*.

*rossi* Kief.

*santæclaræ* Ful.

*suttoni* (Bas.)

*vaccinifoliæ* Ash.

*niger* Ful.

*Ceroptres pompiormis* As..

*dorsalis* Prov.

*Compsodryoxenus brunneus* Ash.

*Cynips agrifoliæ* *Callirhytis quercusagrifoliæ*.

*agrifoliæ* *Callirhytis quercusagrifoliæ*—*Rhodites*.

*californicus*—*Andricus quercuscalifornicus*.

*canescens* (Bas.)

*chrysolepida*—*Callirhytis*.

*chrysolepidocala*—*Andricus*.

*corallina* (Bas.)



## SIRICIDÆ.

*Sirex areolatus* (Cr.)  
*californicus* (Ash.)  
*cyaneus*—*juvenalis*.  
*juvenalis* Fabr.  
*Paururus californicus*—*Sirex*.  
*Urocerus albicornis*—*californicus*.  
*areolatus*—*Sirex*.  
*behrensi*—*Sirex*.  
*californicus* Nort.  
*caudatus*—*Xeris spectrum*.  
*morrisoni*—*Xeris*.  
*Xeris morrisoni* (Cr.)  
*tutatrix* Fitch.  
*erythrocephala* Banks.

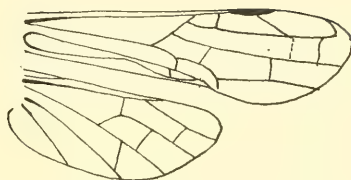


Figure 136. Diagram of the venation of Siricina.

## TENTHREDININA.

## CIMBYCIDÆ.

*Abia americana* (Cr.)  
*Cimbex rubida* Cr.

*Trichiosoma lanuginosa* Nort.  
*Zaræa americana*—*Abia*.

## SELANDRIIDÆ.

*Eriocampa cerasi* (Peck).  
*Selandria cerasi*—*Eriocampa*.

*Tenthredo cerasi*—*Eriocampa*.

## DOLERIDÆ.

*Dolerus coccinifera* Nort.  
*cookii* Clarke.  
*distinctus* Nort.  
*parvuila* Cr.

*sericeus* Say.  
*tejonensis* (Nort.)  
*Losytheus tejonensis*—*Dolerus*.

## TENTHREDINIDÆ.

*Aphanius lenis* Roh.  
*Allantus annularis* Nort.  
*basilaris* Say  
*interruptus* Nort.  
*limbatus* Cr.  
*Claremontia typica* Roh.  
*Hylotoma cœrulea* Marl.  
*Labida doanei* Roh.  
*Macrophya bicolorata* Cr.  
*californica* (Nort.)  
*fumator* Nort.  
*jugosa* Cr.  
*napiensis* Roh.  
*pieuricincta* Nort.  
*pumila* Nort.  
*subviolacea* Cr.  
*Pereclista leucostoma* Roh.  
*Pleuroneura californica* Ash.

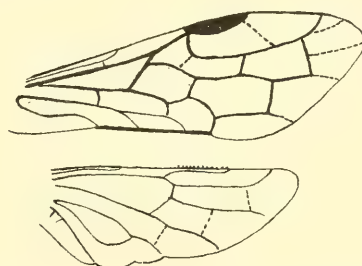


Figure 137. Diagram of the venation of Tenthredinina.

*Strongylogaster distans* Nort.  
*fidus* Cr.

*Tenthredo addenda* Cr.  
 (atlantus—flavomarginis.  
 californicus—*Macrophya*  
*diluta* Cr.  
*edwardsii* Cr.  
*flavomarginis* Nort.

*fumipennis* Nort.  
*lateraria* Cr.  
*obscuripennis* Nort.  
*parvula* Cr.  
*variata* Nort.  
*varipicta* Nort.

#### NEMATIDÆ.

The best known member of the family is the gooseberry sawfly *Pteronus ribesii* Scop. which does not occur west of Missouri. Our *P. thoracicus* has been bred from *Amelanchier canadensis*. The smaller genera may be distinguished as follows:

*Gymnononychus*: claws simple. *Pristophora*: claws with a short tooth.  
*Pontania*: length not over 5.5 m.m. *Amauronematus*: mesonotum and pleuræ opaque.

*Pontania* produce the common conspicuous galls on willow leaves and *Gymnonynchus* is our pear sawfly.

Monograph:—Marlatt, Bull. U. S. Ent. Tech. ser. 3.

*Amandonematis californicus* Marl.  
*coquilletti* Marl.  
*Gymnonynchus californicus* Marl.  
*Nematus edwardsi*—*Pteronus*.  
*erithrogaster*—*Pteronus*.  
*iridescens*—*Pteronus*.  
*mendicus*—*Pteronus*  
*pava*—*Pontania*.  
*singularis*—*Gymnonynchus*.  
*thoracicus*—*Pteronus*.  
*trivittata*—*Pteronus mendicus*.  
*vertebratus*—*Pteronus*.  
*vicinialis*—*Pteronus*.  
*Pontania californicus* Marl.  
*excavatus* Marl.  
*nevadensis* (Cr.)  
*pacifica* Marl.

*parva* (Cr.)  
*resinicola* Marl.  
*truncata* Marl.  
*Pristophora siskyouensis* Marl.  
*Pteronus californicus* Marl.  
*edwardsii* (Cr.)'  
*erithrogaster* (Nort.)  
*iridescens* (Cr.)  
*koebelei* Marl.  
*mendicus* (Walsh).  
*occidentalis* Marl.  
*thoracicus* (Har.)  
*unicolor* Marl.  
*vancouverensis* Marl.  
*vertebratus* (Say).  
*vicinialis* (Cr.)

#### HYLAMTOMIDÆ.

*Hylatoma coerulea* Nort.  
*Schizocerus crawii* (Prov.)

*Sphacophilus crawii*—*Schizocerus*.

#### LOPHYRIDÆ.

*Lophyrus edwardsi* Nort.  
 PAMPHILIIDÆ.  
*Lophyrus bucephalis*—*Pamphilus*.  
*pacificus*—*Pamphilus*.  
*verticalis*—*Pamphilus*.

*Pamphilus bucephalus* (Cr.)  
*pacificus* (Nort.)  
*verticalis* (Cr.)  
*caudatus* Nort.  
*nigricornis* Nort.



## DIPTERA.

The term fly has come to signify a member of the order Diptera, tho in combination the name is used in most of the orders, as sawfly, butterfly, greenfly, whitefly, dragonfly, mayfly, etc. The most constant distinguishing characteristic is the structure of the hind wing, which is a short slender knobbed appendage called the halter, often covered and partly concealed by a lobe of the front wing. When the front wings are absent the halteres also disappear.

The mouth parts are extremely variable, sometimes all the parts are present

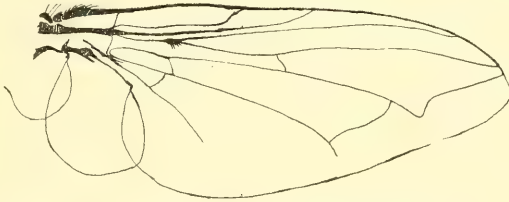


Figure 138 Wing of the house fly.

but with mandibles and maxillæ modified into piercing organs and the epipharynx and hypopharynx may be developed into additional lancets, the labium which is always without palpi forming a sheath enclosing all the lancets. In the majority of flies the mouth is more or less simplified by the reduction or suppression of parts and in a few cases the whole mouth is rudimentary. The labium remains relatively large in all functional mouths. The one to five jointed maxillary palpi present the most characters of systematic value in the varying number size and shape of the joints

The antennæ show a great range of structure, being comparatively simple and many jointed in the lower forms, but the higher flies have the third joint enlarged and variously modified and the remaining joints reduced often

appearing as a simple bristle on the side of the third joint.

The venation affords the most important characters used in classification. Great diversity occurs. The marginals are usually well developed, sometimes continuous around the wing. The anterior marginal is often called the costal. The primary usually has three branches, the third being sometimes forked.

The independent vein divides the two basal cells and encloses the discal cell, the large or posterior cross vein closing it externally. The small or anterior cross vein connects with the primary closing the first basal cell and the posterior basal cross vein connecting with the posterior vein closes the second basal cell. There are usually two posterior veins enclosing the third basal or anal cell. The open cells beyond the basal cells are called the posterior cells the first being opposite the first basal.

A system of formulæ has been devised constructed by listing the bars of the discal cell in the order of their size, numbering them outwardly in order using the even numbers below. The following list includes most of our genera of crane flies.

Amalopsis.	3 6 7 (1 2 4) 5*
Bittacomorpha.	1 — 2 1
Ctenophora.	3 1 4 (2 5* 6)
Dicranomyia	1 — 2 3 1 5 — 3 4 1 6 5 2
Dichranoptycha.	3 4 2 1 7 5
Elliptera.	3 2* 1
Eriocera.	5 4 6 (1 7) 2 3
Erioptera.	4 3 2 1 — 4 2 1 — 3 4 2 5 1
Geranomyia.	3 4 (1 6) 5 2*
Helobia.	1 — 3 6 4 2* 5 1
Holorusia	3 2 6 4 1 5*
Limnobia	2 3 1 4 5
Limnophila.	5* 4 3 1 6 (2 7) — 3 2 4 (1 6) 5 — 3 2 5* 4 1 6 7
Pachyrinia	3 1 — 1
Pedicia	3 2 1 5 4
Ptychoptera.	1 2
Raphidolabis.	3 2 1 — 3 2 4 1
Tipula.	3 4 1 5 2 — 3 6 5* (1 7) (2 4)
Trichocera	2 5* 3 1 6 7 4
Trimicra.	2 3 4 5 1

The nomenclature of the veins most used consists in numbering the longitudinal veins from one to six of which the independent is the fourth. Schiner names these subcostal, radial, cubital, discoidal, postical and anal veins Comstock calls the first three the radius, the remainder the media, cubital and anal. He interprets the posterior basal crossvein as a branch of the cubital vein.

## SYNOPSIS OF FAMILIES.

**Bombyliidæ:** discal adjacent to last posterior, and each about equal to second basal cell.

**Tachinidæ:** arista bare and calypteres large.

**Asilidæ:** proboscis horny and face densely bristly below.

**Syrphidæ:** spurious vein present.

**Tipulidæ:** thorax with v-shaped suture dorsally.

**Empidæ:** discal and last two basal cells about equal in length and in distance from hind edge of wing.

**Dolichopidæ:** discal and second basal cells confluent and first basal cell very short.

**Tabanidæ:** last fork of primary vein spreading widely.

**Culicidæ:** veins clothed with scales.

**Mycetophilidæ:** antennæ longer than thorax. **Psychodidæ:** body and wings densely hairy. **Cecidomyidæ:** tibiæ without spurs. **Chironomidæ:** veins very feeble on hind half of wing.

**Stratiomyidæ:** basal cells more than twice as long as discal cell.

**Trypatidæ:** auxiliary vein absent. **Borboridæ:** hind metatarsi shorter than other joints and thickened. **Ephydridæ** and **Oscinidæ:** discal and second basal cells confluent and third basal absent, the latter consisting of pale colored flies. **Agromyzidæ**, **Geomyzidæ** and **Drosophilidæ:** with oral vibrissæ, the first with hind cross vein before middle of the wing, the last with long plumose or pectinate antennæ.

**Threvidæ:** five posterior cells. **Leptidæ** and **Cyrtidæ:** three pads between the claws, the latter with the head very small.

**Muscidæ:** calypteres large. **Æstridæ:** oral opening small. **Anthomidæ:** first posterior cell wide open. **Sarcophagidæ:** with outer half of arista bare. **Dexidæ:** base of abdomen bristly.

**Ortalidæ:** antennæ with dorsal arista. **Pipiculidæ:** head nearly as large as thorax. **Conopidæ:** with long slender proboscis. **Sepsidæ**, **Scatophagidæ** and **Helomyzidæ:** with oral vibrissæ, the last with costa pectinate, the second front bristly near antennæ. **Micropezidæ:** head subspherical. **Sapromyzidæ** and **Sciomyzidæ:** first two abdominal segments not at all coalesced, the abdomen of the latter elongate.

**Pulicidæ:** wingless. **Sarcopsyllidæ:** labial palpi only one jointed.

**Simuliidæ:** heavy veins near costa only. **Phoridæ:** antennæ apparently only one or two jointed.

**Blepharoceridæ:** wings marked by a net of fine lines.

**Midaidæ**. **Bibionidæ:** antennæ many jointed. **Apioceridæ** and **Scenopinidæ:** head not hollowed out between the eyes, the latter with only three posterior cells.

The fleas and winged bird lice specialized as parasites on vertebrates are generally separated from other flies tho retained within the order. The more typical flies have generally been classified in one of two ways, by the

structure of the antennæ, or according to the method of escaping from the pupa. These two schemes are now commonly combined making three groups, one with many jointed antennæ, one with a short antenna and the pupa skin splitting normally, and a third group with a circular split.

## HIPPOBOSCINA.

### HIPPOBOSCIDÆ

This family includes the winged birdlice and also certain tick-like flies. *Lipotentia* with rudimentary wings, which infests deer, and *Melophagus* entirely wingless, on sheep. They differ from all other insects by the fact that the whole larval life is passed within the body of the parent. For this reason the family was at one time separated as a distinct order.

*Hippobosca* *ovinus*—*Melophagus*.

*ovinus* (Linn.)

*Lipotentia* *depressa* (Say.)

*Olfersia* *impressa*—*Stilbometopa*.

*Melophagus* *depressus*—*Lipotentia*.

*Stilbometopa* *impressa* (Big.)

## TRYPETINA.

### AGROMIZIDÆ.

The larva of *Agromyza* *simplex* is reported as burrowing in asparagus stems and numerous eastern species attack other plants. An eastern *Desmometopa* has been bred from human excrement while *Leucopsis* and *Coptochætum* are parasitic, the latter on the cottony cushion scale.

*Agromyza* *pictella* Thom.

*Desmometopa* *halteralis* Coq.

*platyptera* Thom.

*m-nigrum* Zett.

*simplex* Loew.

*Leucopsis* *nigricornis* Big.

*Coptochætum* *Iceriæ* Wil.

*Ochthiphila* *lispina* Thom.

### DROSOPHILIDÆ.

One species of *Drosophila* is reported as mining the leaves of cabbages but most of the species live in decaying fruit and vegetables.

*Drosophila* *apicata* Thom.

### OSCINIDÆ.

The larvæ of all the species of the largest genus *Chlorops* as far as known feed on the stems of grasses including wheat, and *Meromyza* is considered a very important pest. Our species of *Oscinnus* has been reported from wheat but has also been bred from human excrement. *Gaurax* lives in the egg masses of spiders.

*Chlorops* *assimilis* Macq.

*Hippelates* *genalis* Thom.

*graminea* Coq.

*Meromyza* *americana* Fitch.

*proxima* Say.

*microcentris* Coq.

*rubida* Coq.

*McSillus* *æneus* Fall.

*Gaurax* *aranææ* Coq.

*Oscinnus* *trigramma* Loew.

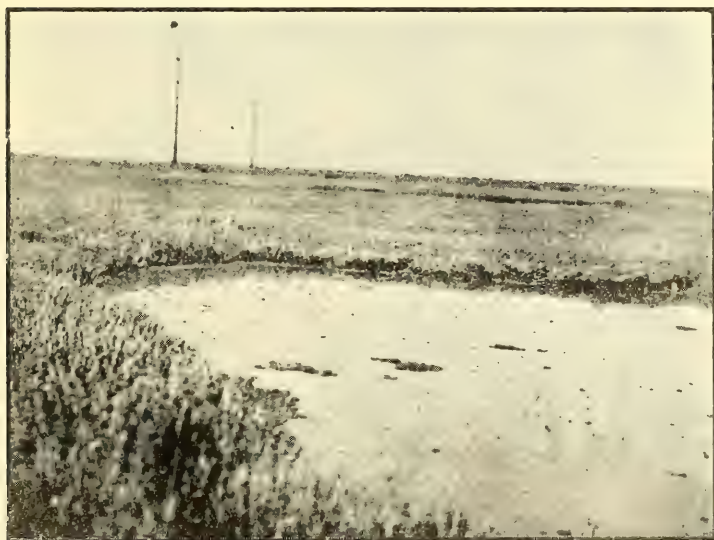


Figure 139 Breeding places of *Ephydra milbræ*



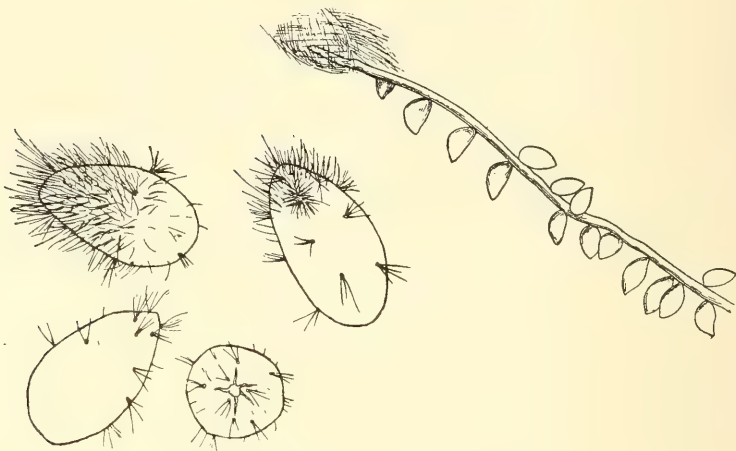


Figure 140 Eggs of *Ephydra milbræ*.

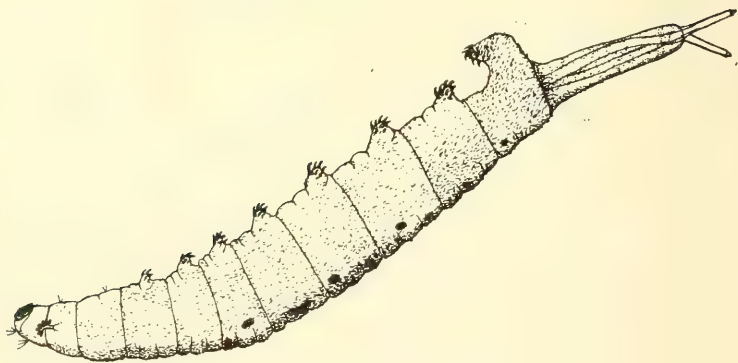


Figure 141 Larva of *Ephydra milbræ*.

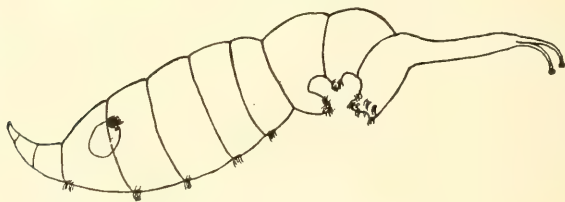
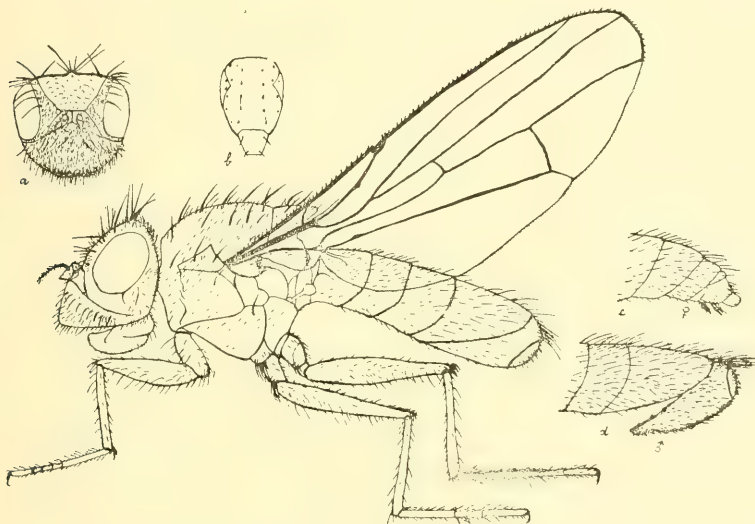


Figure 142 Pupa of *Ephydra milbræ*.

## EPHYDRIDÆ.

*Cænia bisetosa* Coq.  
*Ephydra californica* Pad.  
     *cinerea* Jones.  
     *milbræ* Jones.  
     *pentastigma*—*Scatella*  
     *tarsata* Wil.  
*Hydrellia scapularis* Loew.  
*Musca mantis*—*Ochthera*.  
*Notiophila decoris* Wil.

*quadrissetosa* Thom.  
*Ochthera mantis* (DeG.)  
*Parydra appendiculata* Loew.  
     *aurata* Jones.  
*Pelina brevis* Walk.  
*Pelomyia occidentalis* Wil.  
*Psilopa compta* Meig.  
     *petrolei* Ccq.  
*Scatella pentastigma* (Thom.)  
*Scatophila hamifera* Beck.

Figure 143 *Ephydra milbræ*.

## SEPSIDÆ.

The cheese maggot *P. casei* also attacks smoked meats. Species of the other two genera live in excrement.

*Musca casei*—*Piophilæ*.  
*Nemopoda atterima* Big.  
     *fulvicoxalis* Big.  
*Piophilæ casei* (Linn.)

*concolor* Thom.  
     *obscuripennis* Big.  
*Sepsis ecalcarata* Thom.

## MICROPEZIDÆ.

*Calobata lasciva* Fabr.

## TRYPETIDÆ.

This family contains the fruit flies, highly injurious in other countries, but none of our local species are troublesome.

*Acidia fratria* Thom. ✓  
*Carphotrichia culta* Wied. ✓

*cultaris*—*culta*. ✓  
*Ensina aurifera* Thom. ✓



Figure 144 Larva of Mexican orange maggot.



Figure 145 Pupa of Mexican orange maggot.



Figure 146 Fly of Mexican orange maggot.

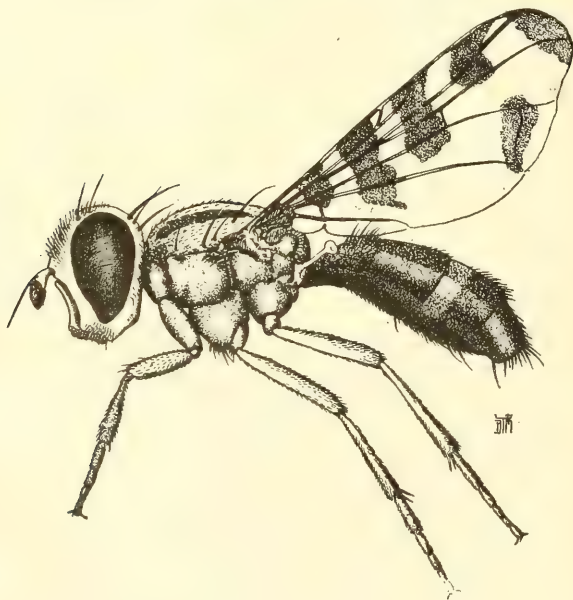


Figure 147 An Ortalid fly.

- |   |   |
|---|---|
| <i>EuaRESTA</i> <i>abstersa</i> Loew. ✓     | <i>genalis</i> Thom.                    |
| <i>adpersa</i> Coq. ✓                       | <i>rufipennis</i> Doane. ✓              |
| <i>bellula</i> Loew. ✓                      | <i>Trypeta</i> <i>achillæ</i> John. ✓   |
| <i>californica</i> Coq. ✓                   | <i>californica</i> Doane. ✓             |
| <i>rufipennis</i> Doane. ✓                  | <i>gemella</i> Coq. ✓                   |
| <i>Eustreta</i> <i>sporosa</i> Wied. ✓      | <i>aurifera</i> — <i>Ensina</i> .       |
| <i>Neospilota</i> <i>signifera</i> Coq. ✓   | <i>culta</i> — <i>Carptotricha</i> . ✓  |
| <i>Rhagoletis</i> <i>formosa</i> Coq. ✓     | <i>femoralis</i> — <i>Urellia</i> .     |
| <i>zephрина</i> Snow. ✓                     | <i>fratria</i> — <i>Aldidia</i> . ✓     |
| <i>Tephritis</i> <i>acutangula</i> Thom. ✓  | <i>longipennis</i> — <i>Straussia</i> . |
| <i>Straussia</i> <i>longipennis</i> Wied. ✓ | <i>Urellia</i> <i>femoralis</i> Thom. ✓ |
| <i>affinis</i> Snow. ✓                      | <i>naverna</i> Walk.                    |

## ORTALIDÆ.

Like the preceeding family many of the species have highly decorated wings.

- |  |   |
|--|---|
| <i>Acrosticta</i> <i>dichroa</i> Loew.   | <i>Euxesta</i> <i>notata</i> Wied.          |
| <i>fulvipes</i> Coq.                     | <i>Eurycephala</i> <i>myopæformis</i> Roed. |
| <i>Anacampsa</i> <i>latiuscula</i> Loew. | <i>willistonii</i> Coq.                     |
| <i>pyrrocephalus</i> Loew.               | <i>Tetropismenus</i> <i>hirtus</i> Loew.    |
| <i>Diacrita</i> <i>æmula</i> Loew.       | <i>Ulida</i> <i>rubida</i> Loew.            |
| <i>Epiplatea</i> <i>scutellaris</i> Coq. |   |

## GEOMYZIDÆ.

The larvæ of these flies live in the stems of plants.

- |   |                                  |
|---|----------------------------------|
| <i>Anthomyza</i> <i>variegata</i> Loew. | <i>Zagonia</i> <i>flava</i> Coq. |
| <i>Baliptera</i> <i>lurida</i> Loew.    |                                  |

## SAPROMYZIDÆ.

The larvæ live in decaying vegetable matter.

- |                                      |                            |
|--------------------------------------|----------------------------|
| <i>Lonchæa</i> <i>polita</i> Say.    | <i>Iupulina</i> Fabr.      |
| <i>Luxania</i> <i>albiset a</i> Coq. | <i>notata</i> Fall.        |
| <i>nasalis</i> Hhom.                 | <i>planiscutum</i> Thom.   |
| <i>Sapromyza</i> <i>connexa</i> Say. | <i>quadrisetosum</i> Thom. |
| <i>flaveola</i> Coq.                 | <i>univittata</i> Coq.     |
| <i>livingstonia</i> Coq.             |                            |

## SCIOMYZIDÆ.

Larvæ aquatic.

- |                                      |  |
|--------------------------------------|--|
| <i>Sciomyza</i> <i>humilis</i> Loew. | <i>Tetanocera</i> <i>pictipes</i> Lew. |
| <i>nana</i> Fall.                    | <i>plumosa</i> Loew.                   |

## BORBORIDÆ.

- |                                      |                         |
|--------------------------------------|-------------------------|
| <i>Borborus</i> <i>equinus</i> Fall. | <i>fontinalis</i> Fall. |
| <i>Limnosia</i> <i>aldrichi</i> Wil. |                         |

## HELOMYZIDÆ

- |                                       |                                      |
|---------------------------------------|--------------------------------------|
| <i>Anorostoma</i> <i>grandis</i> Dar. | <i>Helomyea</i> <i>limbata</i> Thom. |
| <i>maculata</i> Dar.                  | <i>lineata</i> Walk.                 |
| <i>opaca</i> Cq.                      | <i>Siligo</i> <i>litorea</i> Ald.    |
| <i>Leria</i> <i>pectinata</i> Loew.   |                                      |

## SCATOPHAGIDÆ.

These flies are very abundant on fresh cow manure upon which the larvæ feed.

*Musca ctercoraria*—*Scatophaga*.

*Scatophaga furcata* Say.  
*thinobia* Thom.

*stercoria* (Linn.)

*Scatomyza apicata* Thom.

## MUSCINA.

## ANTHOMYIDÆ.

The food habits of the larvæ of this family are quite variable, including the feeding on living plants as leaf miners or root borers.

*Anthomyia micropteryx* Thom.

*ochripes* Thom.

*orthogaster* Thom.

*Coenosia argentata* Coq.

*canescens* Stein.

*majuscula* Coq.

*verna* (Fabr.)

*Fannia æthops* Mal.  
*benjamini* Mal.

*Hylemyia acanthoe* Walk.  
*variata* Fall.

*Limnophora cyrtoneura* Stein.

*Musca verna* *Coenosia*.

*Ophyra leucostoma* Wied.

*Phaonia varipes* Coq.

*Schoenomyza chrysostoma* Loew.

*Tetramerinx femorata* Mal.

## MUSCIDÆ.

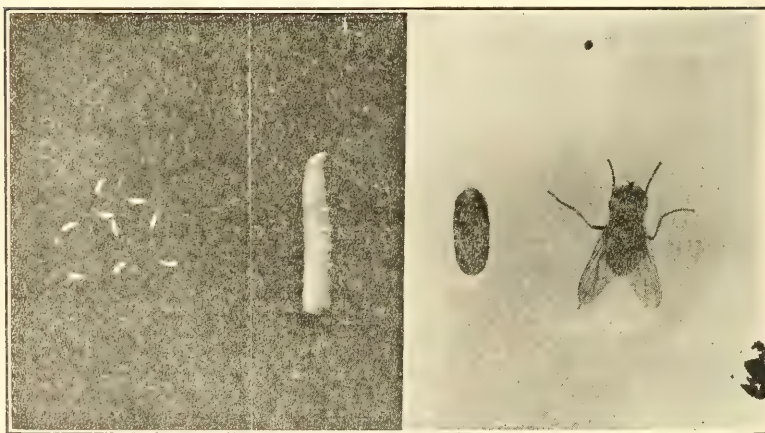


Figure 148 Life history of the house fly.

The house fly, *Musca domestica*, the stable fly, *Stomoxys*, the blue bottle flies, *Calliphora*, the screw-worm fly, *Chrysomya marcelaria* and the horn fly, *Hæmatobia*, are all very common and important insects. The relation of



the house fly in the spreading of typhoid fever has caused special effort to be put forth to prevent their breeding in stable manure. See California Bulletin No. 215.

## SYNOPSIS OF GENERA.

**Lucilia**: proboscis not elongate and row of vertical bristles above hind leg  
**Pollenia** and **Chrysomyia**: vibrissal angles distant from oral margin, the latter bright metallic flies. **Phormia**: mesonotum flattened behind transverse suture.  
**Calliphora**: cheeks hairy.

**Musca**: proboscis not elongate. **Pyrelia** and **Pseudopyrelia**: middle tibiæ with a prominent bristle on the inner surface beyond the middle, the latter with angle of fourth vein rounded. **Myiopsila**, **Morelia** and **Muscina**: last section of fourth vein only broadly curved, the first with eyes pubescent, the last with first posterior cell broadly open.

**Stomoxus**. **Hæmatobia**: palpi nearly as long as proboscis.

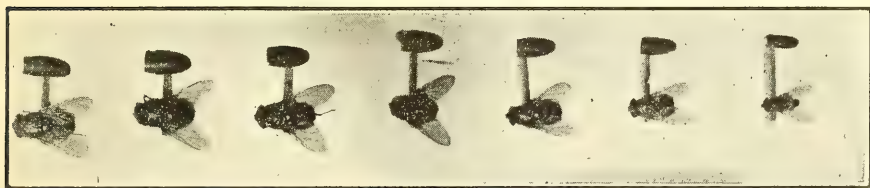


Figure 149 Effect of quantity of food on size.

**Calliphora coloradensis** Hough.  
**vomitaria** (Linn.)

**Chrysomyia marcellaria** Fabr.  
**wheeleri** Hough.

**Conops calcitrans**—**Stomoxys**.

**Hæmatobia serrata** Desv.

**Lucillia cæsar** (Linn.)

**proxima** (Walk.)

**sericata** Meig.

**stigmaticollis**—**Phorma regina**.

**Musca cæsar**—**Lucilia**.

**cornicina**—**Pseudopyrellia**.

**domestica** Linn.

**proxima**—**Lucilia**.

**regina**—**Phormia**.

**rudis**—**Pollenia**.

**vomitaria**—**Calliphora**.

**Morellia micans** Macq.

**Muscina recurva** Thom.

**Myospila medilabunda** Fabr.

**Nitellia glabricula**—**Pollenia**.

**Phorma regina** Meig.

**Pollenia glabricula** Big.

**rudis** (Fabr.)

**Pyrellia frontalis** Thom.

**Pseudopyrelia cornicina** (Fabr.)

**Stomoxys calcitrans** (Linn.)

## SARCOPHAGIDÆ.

The members of this family are called flesh flies. The larvæ feed on all kinds of decaying matter.

**Sarcophaga davidsonii** Coq.  
**orpifera** Coq.

**palliventris** Thom.

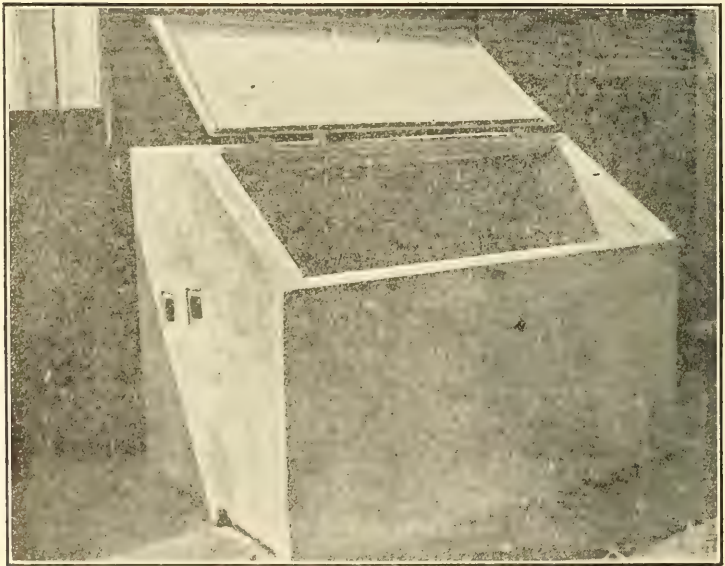
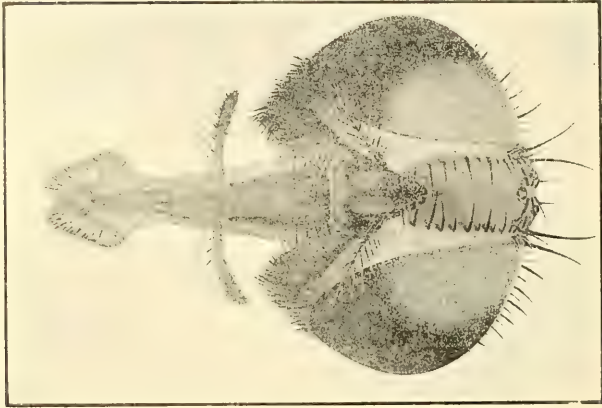


Figure 150. Head and mouth parts of a house fly and concrete manure bin.

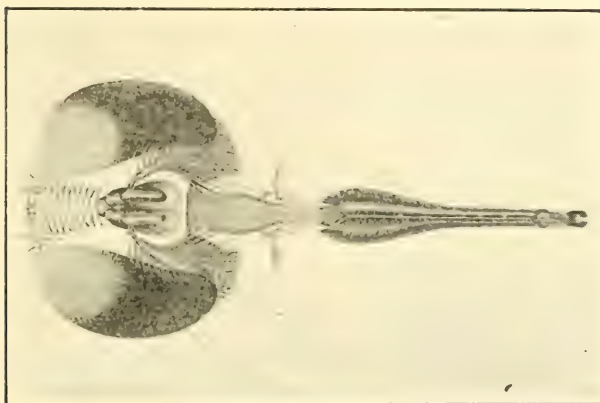


Figure 151. Head and mouth parts of a stable fly and bacteria culture spread by a fly.

## DEXIIDÆ.

*Melanodexia tristis* Walk.*Morphomyia rufinotata* Big.

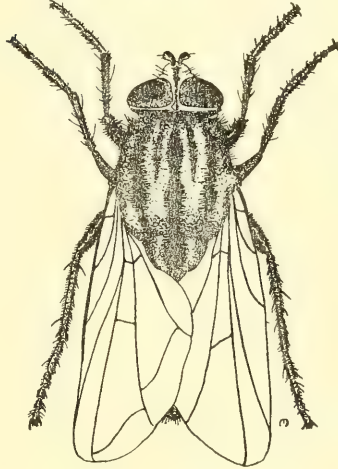
## TACHINIDÆ.

This family and the last are parasitic on other insects.

- Acemyia dentata* Coq.  
     *tibialis* Coq.  
*Admontia retinæ* Coq.  
     *setigera* Coq.  
*Aphria ocypterata* Town.  
*Archytas analis* Fabr.  
*Arthropoda singularis*—*Paradidyma*.  
*Belvoisia bifasciata* Fabr.  
*Biomyia geogiæ* B.&B.  
*Biepharipeza adusta* Loew.  
     *monticola*—*Chætogædia*.  
*Brachycoma davidsoni* Coq.  
*Celatoria crawii*—*diabroticæ*.  
     *diabroticæ* Shi.  
     *spinosa* Coq.  
*Chætogædia crebra* Wulp.  
     *monticola* (Big.)  
*Clistogaster divisa* Loew.  
     *immaculata* Macq.  
*Clausiella setigera* Thom.  
*Cuphocera californiensis* Macq.  
*Dejeania rutilioides*—*Paradejeania*.  
*Demoticus melitææ* Coq.  
*Dexia pedestris*—*Hypostoma*.  
*Drepanoglossa occidentalis*—*Epigri-*  
     *myia*.  
*Echinomyia algens* Wied.  
     *dakotensis* Town.  
     *decisa* Walk.  
     *infumata*—*palpalis* Coq.  
*Epalpus bicolor* (Wil.)  
     *signiferus* (Walk.)  
*Eumacronychia decens*—*Hilerella*.  
*Euphorocera claripennis* Macq.  
*Epigeimyia occidentalis* Coq.  
     *setigera* Coq.  
*Exorista chelionum* Rund.  
     *confinis* Fal.  
     *futilis* O.S.  
     *nigripalpus* Town.  
*Frontania aleticæ* Ril.  
     *armigera* Coq.  
     *turgida* Coq.  
     *frenchi* Wil.  
*Gædiopsis setosa* Coq.  
*Gonia capitata* DeG.  
*Graphomyia maculata* Scop.  
*Gymnosoma fuliginosa* Desv.  
*Heteropterina nasoni* Coq.
- Hilarella aristatis* Coq.  
     *decens* (Town.)  
     *siphonina* Zett.  
*Hyalomyia nigrens*—*Phoranthia*.  
*Hypostena ænea* Coq.  
     *barbata* Coq.  
     *pedestris* Wal.  
     *tortricis* Coq.  
     *vanderwulpi* Town.)  
     *Variabilis* Coq.  
*Lasioneura johnsoni* Coq.  
*Leskia eucrata* Big.  
*Leucostoma atra* Town.  
     *neomexicana* Town.  
*Linnæmyia compta* Fal.  
*Lophosis setigera*—*Clausicella*.  
*Macquartia pristis* Walk.  
*Masicera eufitchiæ* Town.  
     *frenchii*—*Frontina*.  
     *pausiseta* Coq.  
*Masistylum macropogon* Big  
*Melanophrys flavipennis* Wil.  
*Melanospora diabroticæ*—*Celatoria*.  
*Metachæta helymus* Walk.  
     *sequax* Wil.  
*Metaplegia occidentalis* Coq.  
*Microphthalma disjuncta* Wied.  
*Micropalpus mizcella*—*Trichophora*.  
*Miltogramma erythrocaria*—*Senotania*.  
     *sephonia*—*Hilarella*.  
     *trilineata*—*Senotainia*.  
*Musca bifasciata*—*Belvoisia*.  
     *planipes*—*Trichopoda*.  
     *radicum*—*Trichopoda*.  
*Myiophasis robusta* Coq.  
*Myocera tibialis* Desv.  
*Myotheria vanderwulpi*—*Hypostena*.  
*Ochthera mantis* DeG.  
*Ocyptera arcuata*—*Xanthalmelana*.  
     *carotinæ* Desv.  
*Pachyophthalmus floridensis* Town.  
*Panzeria radicum* Fabr.  
*Paradejeania rutilioides* Jean.  
*Paradidyma singularis* Town.  
*Parexorista chelonix*—*Exorista*.  
     *confinis*—*Exorista*.  
*Peletaria robusta* Wied.  
*Phorocera claripennis*—*Euphorocera*.  
     *erecta* Coq.

*saundersii* Wil.  
*Phoranthia nigrens* Wulp.  
     *occidentalis* Walk.  
*Phorichæta sequax* Wil.  
*Plagia americana* Wulp.  
*Plusia brevirostris* Coq.  
*Polidea æros* Walk.  
*Prospheripa cerebra*—*Chætogædia*.  
*Pseudochæta argentifrons* Coq.  
*Pseudomyothis tortricis*—*Hypostema*.  
*Saundersia bicolor*—*Epalpus*.  
     *signifera*—*Epapus*.  
*Scopolia sequax*—*Phorichæta*.  
*Senotainia decisa* Town.  
     *rubriventris* Macq.  
     *trilineata* Wulp.  
*Siphona plusiæ* Coq.  
*Siphoplagia anomala* Town.  
*Siphoturmia rostrata* Coq.  
*Spallanzania antennalis* Coq.  
     *hesperidarum* Wil.  
*Sturmia albifrons* Walk.  
     *distincta* Wied.  
     *occidentalis* Wil.  
*Tachina albifrons*—*Sturmia*.  
     *aleticæ*—*Frontina*.  
     *agens*—*Echinomyia*.  
     *analis*—*Archytas analis*.  
     *californica*—*Archytas analis*.  
     *capitata*—*Gonia*.  
     *decisa*—*Echinomyia*.  
     *disjuncta*—*Sturmia*.  
     *distincta*—*Sturmia*.  
     *helumus*—*Meachæta*.

*mella* Walk.  
*robusta* Town.  
     *robusta*—*Pelateria*.  
     *signiferus*—*Epalpus*.  
*Tachinomyia robusta*—*Tachina*.  
*Thereva plumipes*—*Trichopoda*.  
*Trichopoda pennipes* Fabr.  
     *plumipes* Fabr.

Figure 152 *Tachina* fly.

*Winthemia adusta* Loew.  
     *antennalis* Coq.  
*Xanthomelana arcuata* Say.

### ÆSTRIDÆ.

The bot flies are parasitic on animals, *Æstrus* on sheep, *Hypoderma* on cattle, *Gastrophilus* on horses and *Cuterebra* and *Bogeria* on rodents.

#### SYNOPSIS OF GENERA.

*Cuterebra*: mouth parts not rudimentary. *Bogeria*: arista bare.  
*Gastrophilus*, *Æstrus* and *Hypoderma*: first posterior closed or nearly so, the first with the median groove of the face narrowed below.  
*Bogeria princeps* Hust.  
*Cuterebra latifrons* Coq.  
     *leporivora* Coq.  
     *nitida* Coq.  
     *ternebrosa* CCq.  
*Gastrophilus equi* (Clark.)

*nasalis* (Linn.)  
*Hypderma lineata* Vill.  
*Æstrus equi*—*Gastrophilus*.  
     *nasalis*—*Gastrophilus*.  
     *ovis* Linn.



## SYRPHINA

The larvæ of these wasplike flies are parasitic on Hymenoptera.

## CONOPIDÆ.

*Dalmannia picta* Wil.  
*vitiosa* Coq.  
*Myopa conjuncta* Thom.  
*pictipennis* Wil.  
*pilosa* Wil.  
*Oncomyia abbreviata* Loew.

*baroni* Wil.  
*loraria* Lew.  
*Physocephala affinis* Wil.  
*burgessi* Wil.  
*Zodion fulvifrons* Say.  
*triste* Big.

## SYRPHIDÆ.

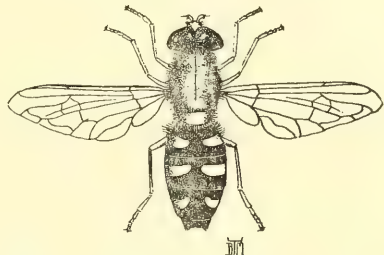
The syrphus flies feed as larvæ in decaying vegetation and those of the genus *Syrphus* and its allies feed on plantlice.

*Allograpta fracta* O.S.  
*obliqua* Say.  
*Ascemosyrphus mexicanus* Macq.  
*oculierus*—*mexicanus*.  
*baptista*—*clavata*.  
*clavata*. Fabr.  
*lemur* O.S.  
*obscuricornis* Loew.  
*Barachopa vacua* O.S.  
*Brachymyia lupina*—*Criorhina*.  
*nigripes*—*Criorhina*.  
*Catabomba pyrastris*—*Lasiophthicus*.  
*Cerea tridens* Loew.  
*Chilosia baroni* Wil.  
*chalybescens* Wil.  
*occidentalis* Wil.  
*pacifica* Hun.  
*pallipes* Loew.  
*townsendi* Hun.  
*willistonii* Snow.  
*Chrysochlamys cæsus* O.S.  
*Chrysogaster bellula* Wil.  
*nigrovittata* Loew.  
*stigma* Wil.  
*Chrysotoxum derivatum* Walk.  
*villosum*—*derivatum*.  
*Copestylum marginatum* Say.  
*Criorhina coquilletti* Wil.  
*humeralis* Wil.  
*lupina* Wil.  
*nigripes* Wil.  
*Crioprora alpeus* O.S.  
*cyaneus* O.S.  
*Didea laxa* Fabr.  
*Eristalis æneus* Fabr.  
*hirtus* Loew.  
*latifrons* Loew.

*stipulator*—*latifrons*.  
*temporalis* Thom.  
*tenax* Linn.  
*Eurhinomamallota lupina*—*Criorhina*.  
*metalica*—*Criorhina lupina*.  
*nigripes*—*Criorhina*.  
*Eupseodes volucris* O.S.  
*Helophilus latifrons* Loew.  
*mexicanus*—*Ascemosyrphus*.  
*polygrammus*—*Ascemosyrphus mexicanus*.  
*similis* Macq.  
*Mesogramma gemmata* Say.  
*marginata* Say.  
*Mesograptia marginata*—*Mesogramma*.  
*Microdon xanthophilis* Town.  
*Musca pipiens*—*Syrphus*.  
*ribesii*—*Syrphus*.  
*tenax*—*Eristalis*.  
*Myolepta varipes* Loew.  
*Ischgroysyrphus tricolor*—*Syrphus velutinus*.  
*Lasiophthicus pyrastris* Linn.  
*Mallota sackeni* Wil.  
*Melanostoma bicruciatum* Big.  
*pachytarsis* Big.  
*p. ctipes* Big.  
*stegnum* Say.  
*Nausigaster punctulata* Wil.  
*Orthoneura nigrovittata*—*Chrysogaster sinuosa*—*Chrysogaster stigmata*.  
*Paragus angustus* Loew.  
*auricaudus*—*Paragus tibialiss*.  
*bicolor* Fabr.  
*pisticodes* Wil.  
*tibialis* Fall.  
*Pipiza auricaudatus*—*Paragus tibialis*.

*Platychirus albimanus* Fabr.  
     *ciliatus*—*albimanus*.  
     *quadratus* Say.  
*Pocata alopes*—*Croiprora*.  
     *cyanella*—*Crioprora*.  
     *bomboides* Hun.  
*Scæva arcuata*—*Syrphus*.  
     *geminata*—*Mesogramma*.  
     *marginata*—*Mesogramma*.  
     *obliqua*—*Allograpta*.  
     *quadratus*—*Platychirus*.  
*Sparzigaster bacchoides*—*Baccha clavata*.  
*Sphærophoria dubia* Big.  
     *infumata* Thom.  
     *melanosa* Wil.  
     *micrura* O.S.  
     *pyrrhina* Big.  
     *sulphuripes* Thom.  
*Specomyia brevicornis* O.S.  
*Spilomyia interrupta* Wil.  
*Syritta pipiens* (Linn.)  
*Syrphus ænaus*—*Eristalis*.  
     *albimanus*—*Platychirus*.  
     *americanus*—*Wied.*  
     *arcuatus* Fall.  
     *bicolor*—*Paragus*.  
     *clavata*—*Baccha*.  
     *fumipennis* Thom.  
     *infumata*—*Sphærophoria*.  
     *intrudens* O.S.  
     *lapponicus*—*arcuatus*.  
     *opinator* O.S.  
     *pigra*—*Xylota*.  
     *protritus* O.S.

*quinquelimatus* Big.  
     *ribesii* Linn.  
     *sulphuripes*—*Sphærophora*.  
     *velutinus* Wil.  
*Triodonta curvipes* Wied.  
*Tropidia quadrata* Say.  
*Volucella avida* O.S.  
     *tan* Big.  
     *temnocera* Loew.  
*Xylota analis* Wil.  
     *barbata* Loew.  
     *curvipes* Lew.  
     *ejuncida* Say.  
     *flavitibia* Big.  
     *obscura* Loew.

Figure 153 *Syrphus* fly.

*pigra* Fabr.  
     *esuriens* Fabr.  
     *marginata*—*Copestylum*.  
     *megacephala* Loew.  
     *mexicana*—*esuriens*.

## PIPUNCULIDÆ.

The flies are notable by their large heads. The larvæ are parasitic. Small parasitic flies.

*Pipicula bidens* Cres.

*Pipuncutus aridus* Wil.

## PHORINA

## PHORIDÆ.

The hunchback flies have very diverse food habits.

*Aphiochæta minuta* Ald.  
     *pulicaria* Fall.  
     *pygmosa* Zett.

*Phora rufipes* Meig.  
*Trineura aterrima* (Fabr.)  
     *velutina* Meig.

## ASILINA

## LONCHOPTERIDÆ.

Lonchoptera lacustris Meig.

lutea Panz.

## EMPIIDÆ.

The larvæ are aquatic feeding on decaying vegetable matter.

Chrysotus subcostatus Loew.

Clinocera maculipes Big.

Drapetis nitidula Mel.

unipila Loew.

Empimorpha barbata Loew.

comantis Coq.

geneatis Mel.

anca Coq.

mira BiBg.

nuda Loew.

valentis Coq.

Hilarcomorpha obscura Big.

Holocera ravida Coq.

Iteaphila peregrina Mel.

Leptopeza disparellus Mel.

Meghyperus occidentis Coq.

Microphorus ravidus Coq.

Nithicomymia rileyi Coq.

tibialis Coq.

Platypalpus æqualis Loew.

canus Mel.

gravidus Mel.

Empis ærobatia Mel.

bigoti Mel.

cinerea—bigoti.

comantis Coq.

discoventris—dolobrararia.

dolobrararia Mel.

falcata Mel.

incultus Coq.

incurvis Mel.

manco Coq.

pluto Mel.

Ramphomyia amplicella Cq.

bifilata Coq.

californica Coq.

curripes Coq.

duplicis Coq.

fimbriata Coq.

loripedis Coq.

luctiosa Loew.

nigrita Big.

scauritissima Whe.

scuellaris Coq.

stylata Coq.

sudigeronis Coq.

Tachydromia schwartzii Coq.

Tachytrechus angustipennis Loew.

sanus O.S.



Figure 154 Empid fly.

Enoplemis mira—Empis.

Euthyneura atripes Mel.

Hilaria cana Coq.

congregaria Mel.

nugax Mel.

Aphrostylus direptor Whe.

grassator Whe.

predator Whe.

## DOLICHOPIDÆ.

Aptorthus nigripes—Mesorhagia.

Campicnemis degener Whe.

Dolichopus afflictus O.S.

*Hercostomus aurifer* Thom.  
*impudicus* Whe.  
*metatarsalis* Thom.  
*Hydrophorus breviseta* Thom.  
*eldoradensis* Whe.  
*Laincalus querulus* O.S.

*canaliculatus* Thom.  
*consanguineus* Whe.  
*corax* O.S.  
*crenatus* O.S.  
*lamellicornis* Thom.  
*metatarsalis*—*Hercostomus*.



Figure 155 Dolichopid fly.

*paluster* Mel.  
*pollex* O.S.  
*tenuipes* Ald.  
*Marcellocerus sanus*—*Tachytrechus*.  
*Medeterus californiensis* Whe.  
*xerophilus* Whe.  
*Mesorhaga nigripes* Ald.  
*Neurigona lienosa* Ald.  
*Nothosympnus vegetus* Whe.

*Paraclius femoratus* Ald.  
*Parasyntormon asellus* Whe.  
*emarginatum* Whe.  
*largotis* Whe.  
*Pelastoneurus cyaneus* Whe.  
*dissimilipes* Whe.  
*longicauda* Loew.  
*occidentalis* Whe.  
*Polymedon flabelifer* O.S.

*Psilopodinus pilicornis* Ald.  
*Sympycus cuprinus* Whe.  
*Synarthrus affinis*—*Syntormon*.  
     *stratægus*—*Syntormon*.  
*Scellus vigil* O.S.

*Syntormon affinis* Whe.  
     *angustipennis* Loew.  
     *stratægus* Whe.  
*Tachytrechus sanus* O.S.

## ASILIDÆ.

The flies of this family are called robber flies. They feed very ravenously on other insects and the larvæ are also predaceous on other larvæ, being found in rotten wood or under the bark of logs.

*Ablantus fulvipes* Coq.  
     *mimus* O.S.  
     *trifarius* Loew.  
*Andrenostoma fulvicauda*—*Nusa*.

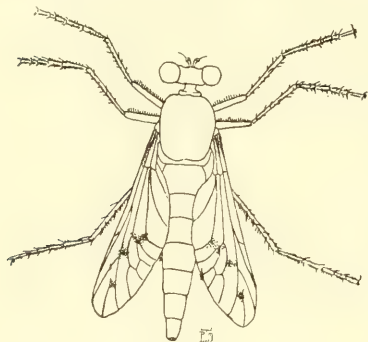


Figure 156 Asilid fly.

*Anisopogon ludius*—*Heteropogon*.  
     *senilis*—*Heteropogon*.  
     *vespoides*—*Heteropogon*.  
*Asilus abdominalis*—*Osprioceous*.  
*Blacodes clausa*—*Cophura*.  
     *cristatus*—*Cophura*.  
     *trunca*—*Cophura*.  
*Chrysoceria pictitarsus* (Big.)  
*Clavator sabulorum*—*Lestomyia*.  
*Cophura clausa* (Coq.)  
     *cristata* (Coq.)  
     *fallei* Back.  
     *truncata* (Coq.)  
*Cyrtopogon aurifer* O.S.  
     *callipedilus* Loew.  
     *cerusatus* O.S.  
     *cretaceus* O.S.  
     *cymbalistata* O.S.  
     *evidens* O.S.  
     *gibber* Big.  
     *leucozonus* Loew.  
     *longimanis* Loew.

*montanus* Loew.  
     *nebulo* O.S.  
     *nigricolor* Coq.  
     *nugator* O.S.  
     *positivus* O.S.  
     *princeps* O.S.  
     *rattus* O.S.  
     *rejectus* O.S.  
     *sudator* O.S.  
*Dasyllis astur* O.S.  
*Dasyopogon argenteus*—*Stictopogon*.  
     *californiæ*—*Stictopogon*.  
     *quadrinotatus* Big.  
     *trifasciatus*—*Stictopogon*.  
*Deromyia pulchra* Bac.  
*Dicolonus simplex* Loew.  
*Dioctria albina* Walk.  
     *parvula* Coq.  
     *pusio* O.S.  
     *resplendens* Loew.  
     *rubida* Coq.  
     *vera* Back.  
*Erax cinerascens* Bel.  
     *furax*—*cinerascens*.  
*Habropogon bilineatus* Wil.  
     *ludens* (Coq.)  
     *senilis*—*Pycnopogon*.  
     *vespoides* Big.  
*Heteropogon ludius* (Coq.)  
     *senilis* (Big.)  
     *vespoides* (Big.)  
*Holopogon appendiculatus*—*Cyrtopogon gibber*.  
     *nitidiventris* Big.  
     *umbrinus* Back.  
*Lampria felis* O.S.  
*Laparus pictitarsus*—*Chrysoceria*.  
*Laphria carbonarius* Wil.  
     *anthrax*—*carbonarius*.  
     *franciscanus* Big.  
     *fulvicauda*—*Nusa*.  
     *rapax* O.S.  
     *ventralis* Wil.



- Lasiopogon arenicola* O.S.  
     *bivittatus* Loew.  
*Leptogaster scapularis* Big.  
*Lestomyia fraudigera* Wi.  
     *sabulonum* (O.S.)  
*Mallophora megachile* Coq.  
*Metapogon gilvipes* Coq.  
*Myelaphus iobicornis* (O.S.)  
     *melas* Big.  
     *rufus* Wil.  
*Neclaparus pictitarsus* Big.  
*Nicocles abdominalis* Wil.  
     *æmulaor* (Loew.)  
     *argentatus* Coq.  
     *dives* (Loew.)  
*Nusa fulvicauda* Say.  
*Ospricerus abdominalis* (Say).  
*Pycnopogon circumatus* O.S.  
     *senilis*—*Heteropogon*.  
*Pygostalus æmulator*—*Nicocles*.

- dives*—*Nicocles*  
*Sarapogon hyalinus* Coq.  
     *luteus* Coq.  
     *semiustus* Coq.  
*Scleropogon jubatus*—*Stenopogon*.  
     *picticornis*—*Stenopogon*.  
*Stenopogon albibasis* Big.  
     *breviusculus* Loew.  
     *californiæ* (Walk.)  
     *gratus* Loew.  
     *jubatus* Loew.  
     *nigritulus* Coq.  
     *obscuriventris*—*californiæ*.  
     *picticornis* Low.  
     *univittatus*—*gratus*.  
*Stictopogon argentatus* Say.  
     *trifasciatus* (Say).  
*Triclis tagax* Wil.  
*Willistonina bilineatus* Back.

## SCENOPIDÆ.

- Pseudotrichia griseola* Coq.

## THEREVIDÆ.

- Metaphragma planiceps* Loew.  
*Nebritis pellucidus* Coq.  
*Psilocephala aldrichii* Coq.  
     *baccata* Coq.  
     *costalis* Loew.  
     *marcida* Coq.  
     *montivaga* Coq.  
     *pavida* Coq.  
*Thereva cornata* Loew.

- crassicornis* Wil.  
     *egressa* Coq.  
     *furcata* Loew.  
     *melaneura* Loew.  
     *nigra* Say.  
     *otiosa* Coq.  
     *semitaria* Coq.  
     *vialis* O.S.

- Xestomyza planiceps*—*Metaphragma*.

## BOMBYLINA

## APIOCERIDÆ.

- Apiocera haruspex* O.S.  
*Apomydas trochilus* Coq.

- Raphiomydas acton* Coq.

## MYDAIDÆ.

The larvæ live in decaying wood and are predaceous.

- Leptomydas concinnus* Coq.  
     *hirtus* Coq.  
     *pantherinus* Gar.  
     *tennuipes* (Loew.)  
*Mydas tenuipes*—*Leptomydas*.  
     *ventralis* Ger.

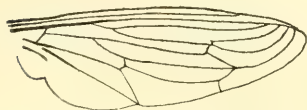


Figure 157 Venation of a Mydiad

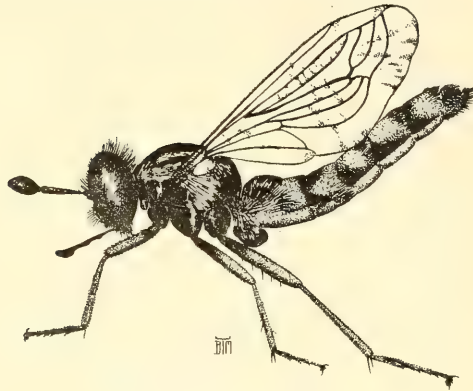


Figure 158 Mydiad fly

**BOMBYLIIDÆ.**

The flies of this family are particularly abundant in species in this state tho the individuals are not excessively numerous. The larvæ are parasitic, some on the eggs of grasshoppers, many on bees and wasps.

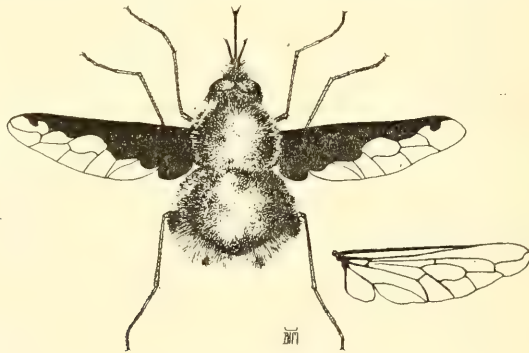


Figure 159 Bombyliid fly

*Agyramoiba cybele*—*Spongostylum*.  
*delila* *Spongostylum*.  
*limatulus*—*Spongostylum*  
*varia*—*Spongostylum*.  
*Amphicosmus elegans* Coq.  
*Anastocchus barbatus*—*nitidulus*.  
*nitidulus* Fabr.  
*Anthrax adumbrata* Coq.  
*ænea* Coq.  
*agrestis*—*Lepidanthrax*.  
*agrippina* O.S.

*alpha* O.S.  
*alternata* Say.  
*anna* Coq.  
*atrata* Coq.  
*bigradata* Loew.  
*campestris*—*Lepidanthrax*.  
*caprea* Coq.  
*catulina* Coq.  
*cautor* Coq.  
*cinefacta* Coq.  
*consessor* Coq.

- arocina* Coq.  
*cumenes* O.S.  
*curta* Coq.  
*diagonalis* Loew.  
*edella*—*perplexa*.  
*edwardsii* Coq.  
*endora* Coq.  
*eumenes* O.S.  
*fenestratoides* Coq.  
*fuliginosa* Loew.  
*fulvicoma* Coq.  
*fumida* Coq.  
*gemella* Coq.  
*hircina* Coq.  
*inaurata*—*Lepidanthrax*.  
*inculta* Coq.  
*inops* Coq.  
*junctura* Coq.  
*junctura*—*Dipalta*.  
*lacunaris* Coq.  
*lanta*—*Lepidanthrax*.  
*lepidota* O.S.  
*levicula* Coq.  
*limatulus*—*Spongostylum*.  
*lucifer* Fabr.  
*mercedis* Coq.  
*mira* Coq.  
*miscella* Coq.  
*mobile* Coq.  
*molitor* Loew.  
*mucorea*—*muscaria*.  
*muscaria* Coq.  
*nebulosa* Coq.  
*nugator* Coq.  
*obscura* Coq.  
*oedipus*—*Spongostylum*.  
*pallidula* Coq.  
*perimele*—*alternata*.  
*perplexa* Coq.  
*poecilogaster* O.S.  
*pretiosa* Coq.  
*pullata* Coq.  
*sabulosa* Coq.  
*scitula* Coq.  
*serpantura* Coq.  
*serpentina*—*Dipalta*.  
*sinuosa* Wied.  
*squamigera* Coq.  
*supina* Coq.  
*syrtis* Coq.  
*systis* Coq.  
*tantilla* Coq.  
*telluris* Coq.  
*terrena* Coq.  
*turbata* Coq.  
*vana* Coq.  
*variata* Coq.  
*varium*—*Spongostylum*.  
*vasta* Coq.  
*vigilans*—*perplexa*.  
*vulpina* Coq.  
*willistonii* Coq.  
*Aphobantus abnormis* Coq.  
*brevistylus* Coq.  
*capax* Coq.  
*catulus* Coq.  
*cervinus* Loew.  
*concinus* (Coq.)  
*desertus* Coq.  
*fucatus* Coq.  
*fumidus* Coq.  
*fumosus* (Coq.)  
*hirsutus* Coq.  
*interruptus* Coq.  
*leviculus* Coq.  
*litus* Coq.  
*marcidus* Coq.  
*mixtus* Coq.  
*mus* O.S.  
*pavidus* Coq.  
*pellucidus* (Coq.)  
*scriptus* Coq.  
*tardus* Coq.  
*transitus* Coq.  
*varius* Coq.  
*vittatus* Coq.  
*vulpecula* Coq.  
*Biblio*  
*capicina*—*Exoprosopa*.  
*lucifer*—*Anthrax*.  
*Bombilius albicapillus* Loew.  
*aurifer* O.S.  
*cachinnans* O.S.  
*cinerius* Big.  
*fratellus*—*major*.  
*lancifer* O.S.  
*laticeps* BBig.  
*major* Linn.  
*metopium* O.S.  
*nitidulus*—*Anastoechus*.  
*recurvus* Coq.  
*syndesmosus* Coq.  
*Coquillettia vandykei* Coq.  
*Dipalta junctura* Coq.  
*serpentina* O.S.  
*Eclimius californicus* Big.  
*melanosus* Wil.  
*puella* Wil.  
*lotus* Wil.  
*marginatus* O.S.  
*muricatus* O.S.

- Epacmus nebritus* Coq.  
     *rufilimbatus* Big.  
*Eucessia rubens* Coq.  
*Exepacmus johnsoni* Coq.  
*Exoprosopa agaszii* Lew.  
     *capicina* Fabr.  
     *bifurca* Lew.  
     *divisa* Coq.  
     *dorcadion*—*capacina* Fabr.  
     *eremita* O.S.  
     *gaurophylax*—*Hyperalonia*.  
     *grata* Coq.  
     *pallens* Big.  
*Exoptata divisa*—*Exoprosopa*.  
*Germinaria pellucida* Coq.  
*Geron cinctura* Coq.  
     *fasciola* Coq.  
     *hybus* Coq.  
     *senilis* Fabr.  
     *trochilus* Coq.  
*Hyperalonia gazophylax* Loew.  
     *lanta* Coq.  
*Lordotus apicula* Coq.  
     *buceros* Coq.  
     *canabis* Coq.  
*Lepidanthrax agrestis* Coq.  
     *angulus* O.S.  
     *campestris* Cq.  
     *inaurata* Coq.  
     *diversus* Coq.  
     *junceus* Coq.  
     *miscellus* Coq.  
     *planus* O.S.  
     *sororcula* Wil  
     *zona* Coq.  
*Mancia nana* Coq.  
*Metacosmus exilis* Coq.  
*Pantarbes capita* O.S.  
*Paracosmus edwardsii* (Loew).  
     *insolens* Coq.  
*Phthiria diversa* Coq.  
     *egerminans* Loew.  
     *humilis* O.S.  
     *notata* Loew.  
     *similis* Coq.  
     *sulphurea* Loew.  
*Ploas amabilis* O.S.  
     *atrata* Loew.  
     *fenestrata* O.S.  
     *johnsoni* Coq.  
     *melanocerata* Big.  
     *nigripennis* Loew.  
     *obesula* Loew.  
     *rufula* O.S.  
     *serrata* Coq.  
*Rhambdoselaphus mus* Big.  
*Spogostylum cybele* Coq.  
     *daphne* (O.S.)  
     *delila* Loew.  
     *limatulus* Say.  
     *œdipus* Fabr.  
     *vandykei*—*Coquillettia*.  
     *varium* Fabr.  
*Systochus oreas* O.S.  
*Thalipsogaster syndesmosus*—*Bombyl-*  
     *ius*.  
*Triplasius novus* Wil.  
*Toxophora maxima* Coq.  
     *pellucida* Coq.  
     *vasta* Coq.

## TABANINA

### CYRTIDÆ.

- Eulonchus marginatus* O.S.  
     *sapphirinus* O.S.  
     *saragdinus* Gers.  
     *tristis* Loew.  
*Oncodes melampus* Loew.  
*Opsebius pancus* O.S.  
     *sulphuripes* Loew.  
*Pterodontia vix* Town.

### LEPTIDÆ.

- Atherix varicornis* Loew.  
*Chrysopila anthracina* Big.  
     *humilis* Loew.  
*Dialysis dispar* BiBg.  
*Hilaromorpha obscura* Big.  
*Leptis costata* Loew.  
     *incisa* Loew.  
*Leptotricha discolor*—*Triptotricha*.  
     *lauta*—*Triptotricha*.  
*Mythicomyia rileyi* Coq.  
     *tibialis* Coq.  
*Rhachicerus honestus* O.S.  
*Symphoromyia cruenta* Coq.  
     *modesta* Coq.  
     *pachyceras* Wil.  
     *trucis* Coq.

*Triptotricha discolor* Loew.  
*dispar*—Dialysis.  
*lauta* Loew.

*Xylomyia pallipes* Loew.  
*subula*—*pallipes*.

TABANIDÆ.

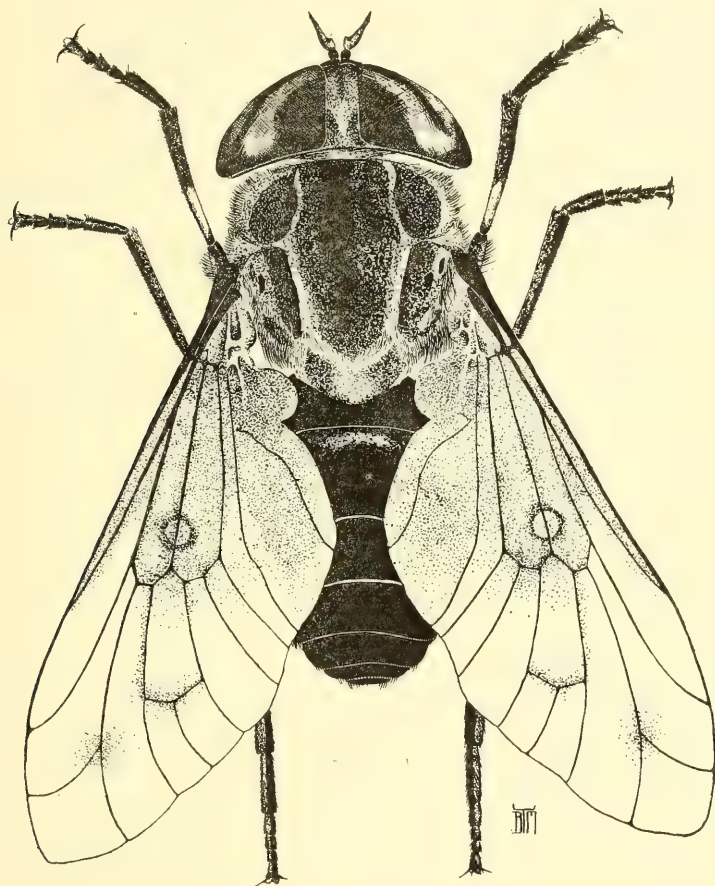


Figure 160 Tabanid fly

The horseflies are not very abundant in California but in other sections are very annoying to stock. The larvæ are predaceous and found in all sorts of situations.

*Apatolestes comastes* Wil.  
*Chrysops fnlvaster* O.S.  
*gigantulus*—Silvius.

*noctifer* O.S.  
*pachycera* Wil.  
*proclivis* O.S.



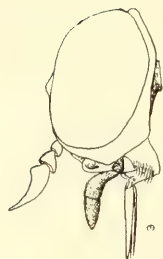


Figure 161 Head and mouthparts of a Tabanid

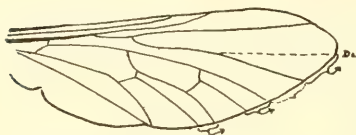


Figure 162 Venation of Tabanidæ and related groups

quadrivittatus—silvius.  
surdus O.S.  
Corizoneura ruficornis—Pangonia.  
velutina—Pangonia.  
Diatominerva californica—Pangonia.  
Hæmatopate americana O.S.  
Pangonia californica (Big.)  
dives Wil.  
hera O.S.  
ruficornis (Big.)  
velutina (Big.)  
Silvius gigantulus (Loew.)  
quadrivittatus Say.  
Tabanus ægrotus O.S.  
captivus Mar.  
comastes Wil.  
episatus O.S.  
insuitus O.S.  
laticeps Hine.  
lineola Fabr.  
phanerops O.S.  
procyon O.S.  
punctifer O.S.  
rhombicus O.S.  
sonomensis O.S.  
Aochletus obscurus Coq.  
Chloromyia viridis—Sargus.  
Clitellaria lata Loew.

#### STRATIOMYIDÆ.

The larvæ are carnivorous and found in various situations.

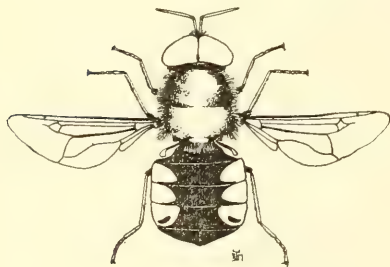


Figure 163 A Stratiomyid fly.

villosulus Big.  
Thermoplectus californicus—Tabanus  
epistatus.  
captonis—Tabanus.  
rustica O.S.

hæmaphorus—Tabanus sonomen-  
sis.  
phænops—Tabanus.  
procyon—Tabanus.  
sonomensis—Tabanus.  
Euparyphus apicalis Coq.  
niger Big.  
septemmaculatus Adams.  
tahoensis Coq.  
Nemotelus arator Mel.  
tristus Big.  
Odontomyia americana Day.  
arcuata Loew.  
binotata—truquii.  
cincta Oliv.  
hadiana Big.  
inequatus Loew.  
megacephala—truquii.  
pilosus Day.  
pubescens Day.  
pyrrhostoma—qilosa.  
truquii Bel.

*Oxcera crotchii* O.S.  
*Sargus viridus* Say.  
*Stratiomyia barbata* Loew.

*nevadæ* Big.  
*maculosis* Loew.  
*melanosoma* Loew.

## BIBIONINA

### BLEPHAROCERIDÆ.

The larvæ live in mountain streams.

*Bibiocephala comstocki* Kel.  
*doanei* Kel.  
*Blepharocera ancilla*—*Philorus*.  
*jordani* Kel.  
*ostensakeni* Kel.

yosemite—*Philorus*.  
*Liponeura* yosemite—*Philorus*.  
*Philorus ancilla* O.S.  
yosemite O.S.

### SIMULIIDÆ.

Buffalo gnats or black flies sometimes become exceedingly annoying on account of their blood sucking habits. The larvæ are aquatic.

*Simulium argus* Wil.  
*bracteatum* Coq.  
*pictipes* Hag.  
*hirtipes* Fries.  
*venustum* Say.  
*vittatum* Zet.

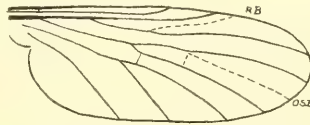


Figure 164 Venation of Simulidæ and related families.

### BIBIONIDÆ.

The larvæ feed on decaying vegetable substances.

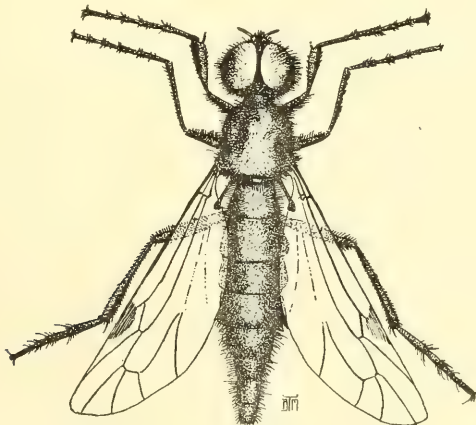


Figure 165 Bibionid fly.

*Bibio hirtus* Loew.  
*nervosus* Loew.  
*Dilophus occipitalis* Coq.

*Scatopse notata* (Linn).  
*Tipula notata*—*Scatopse*.

## TIPULINA

### CECIDOMYIDÆ.

One species, the hessian fly, *Myetiola*, is a very serious pest on wheat, but not particularly so in this state. Other species feed as larvæ on decaying vegetable matter, and one of our species, *Arthrocnodax*, feeds on red spiders.



Figure 167 Larva of a Mycetophilid.  
*Arthrocnodax epiphila* Felt.  
*occidentalis* Felt.  
*Cecidomyia destructor*—*Myetiola*.  
*radiatæ* S.&M.  
*Diplosis piniradiatæ*—*Cecidomyia*.  
*Myetiola destructor* (Say).

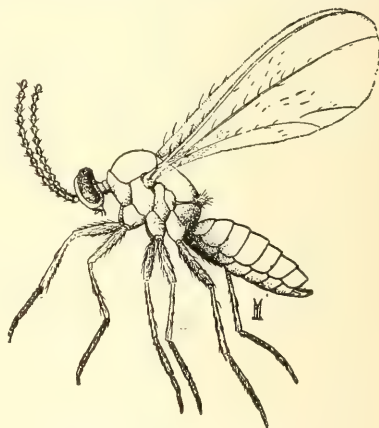


Figure 168 Mycetophilid fly.

### MYCETOPHILIDÆ.

The larvæ feed on decaying vegetable substances.

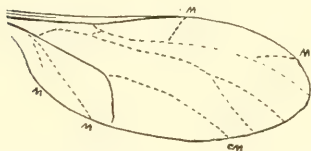


Figure 166 Venation of Mycetophilidæ and related families.

*Acnemia varipennis* Coq.  
*Alodia bella* Joh.  
*delita* Joh.  
*Cœlosia flavicauda* Win.  
*gracilis* Joh.

*lepida* Joh.  
*modesta* Joh.  
*pygophora* Coq.  
*Cordyla neglecta* Joh.  
*Dacosia obscura* Coq.  
*Gnorista megorrhina* O.S.  
*Leia lineola* (Adams).  
*striata* (Wil.)  
*Mycomyia calcarata* (Coq.)  
*frequens*—*littoralis*.  
*littoralis* Say.  
*mendax* Joh.  
*Bolitophila hybrida* Meig.  
*Mycetophila venistrata* Coq.  
*nemoralis*—*Neuratelia*.  
*obscura*—*Dacosia*.

trifasciata Coq.  
*Neoglaphyoptera lineola*—Leia.  
 striata—Leia.  
*Neoempheria pullata*—Platyura Coq.  
*Neuratelia nemoralis* (Meig.)  
 silvatica Coq.

*Platura pullata* (Coq.)  
 scapularis Joh.  
*Rhymosia a* Joh.  
 diffissa Joh.  
 imitator Joh.  
*Sciophila calcarata*—Mycomyia.

## CULICIDÆ.

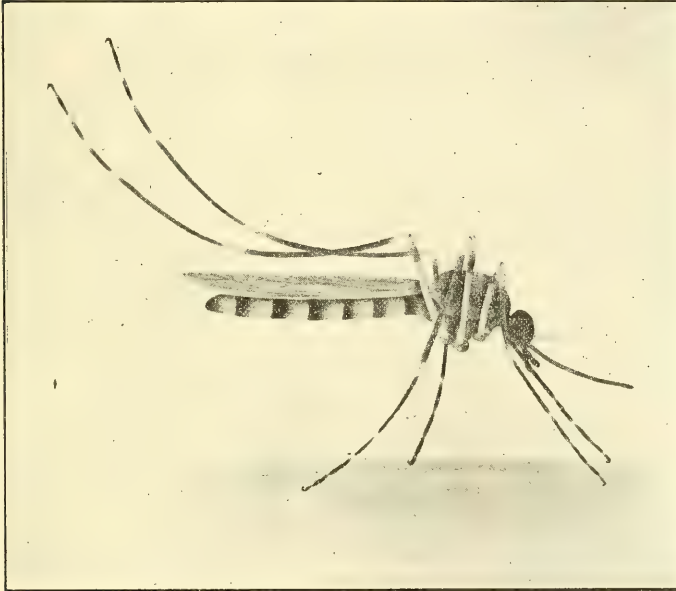


Figure 170 Culiseta.

Mosquitoes are insects of peculiar interest on account of the relation between *Anopheles* and malaria and *Ædes calopus* and yellow fever. The latter insect occurs only rarely in a few sea ports in California and the disease is unknown here. Malaria however is wide spread in the central and northern sections coincident with the distribution of the *Anopheles*. In the San Francisco bay region two species of salt marsh mosquitoes, *Ædes quaylei* and *squamiger* are at times very annoying. Very successful control measures have been employed. (See California Bulletin Number 178). The two most common fresh water mosquitoes in the same region are *Culex tarsalis* and *Culiseta incidens*.

*Ædes æstivalis* Dyer.  
 calopus (Meig.)

curiei (Coq.)  
 damnosa Say.

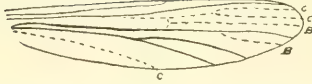


Figure 169 Venation of Culicidæ and related families.

punctipennis Say.  
 Corethra Trivittata Loew.  
 Culex annulatus—Theobaldia.  
 ciliata—Psorophora.  
 cubensis Big.  
 currei—Aedes.

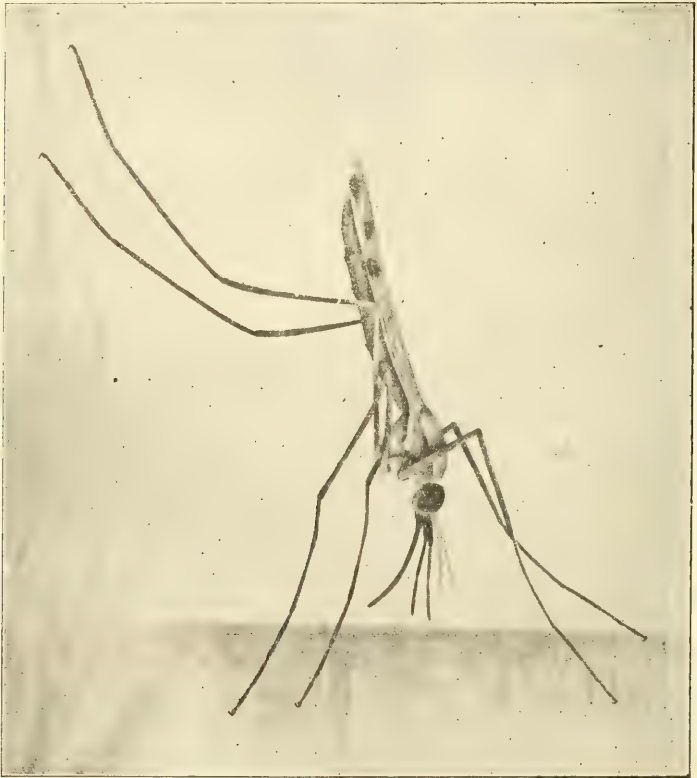


Figure 171 Anopheles.

quaylei D. & K.  
 spenceri (Theo.)  
 squamiger (Coq.)  
 sylvestris (Theo.)  
 varipalpus Coq.  
 vittatus Theo.  
 Anopheles franciscanus McC.  
 maculipennis Mieg.

erythrothorax Dyer.  
 incidens—Culiseta.  
 inornatus—Culiseta.  
 pipiens Linn.  
 pulchripennis—Anopheles.  
 spenceri—Aedes.  
 squamiger—Aedes.  
 stigmatosoma Dyer.



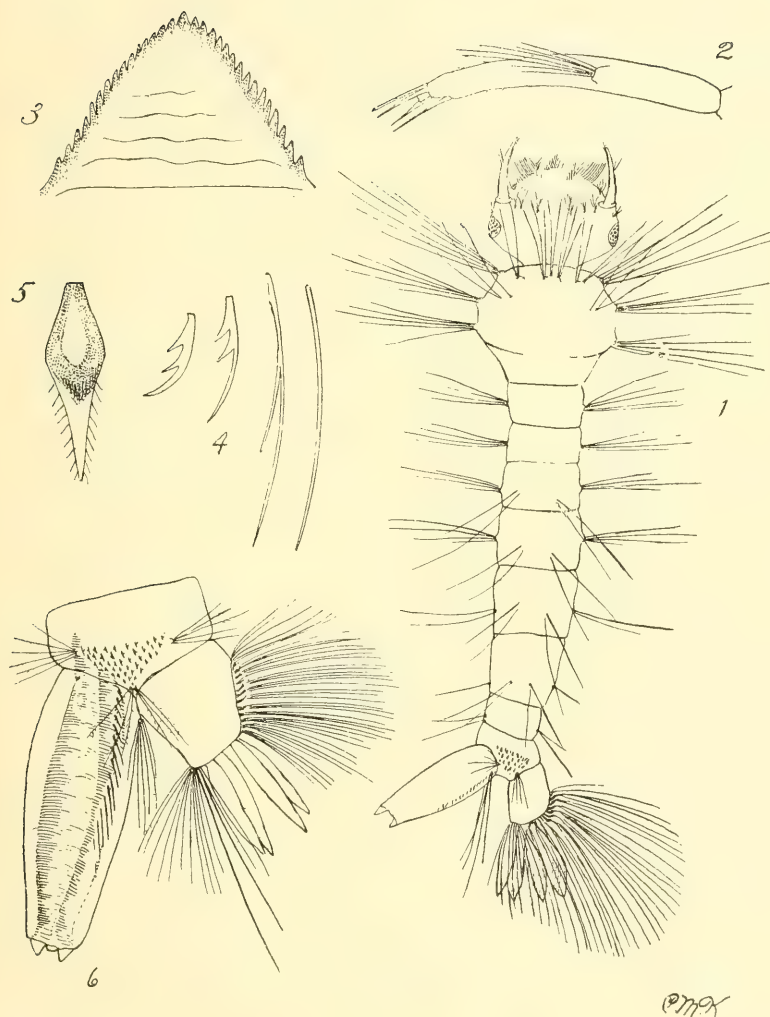


Figure 172 *Culiseta incidens*. 1, larva; 2, antennae; 3, mentum; 4, siphonal spines showing variation; 5, scale of eighth abdominal segment; 6, eighth and ninth abdominal segments and siphon; all enlarged.

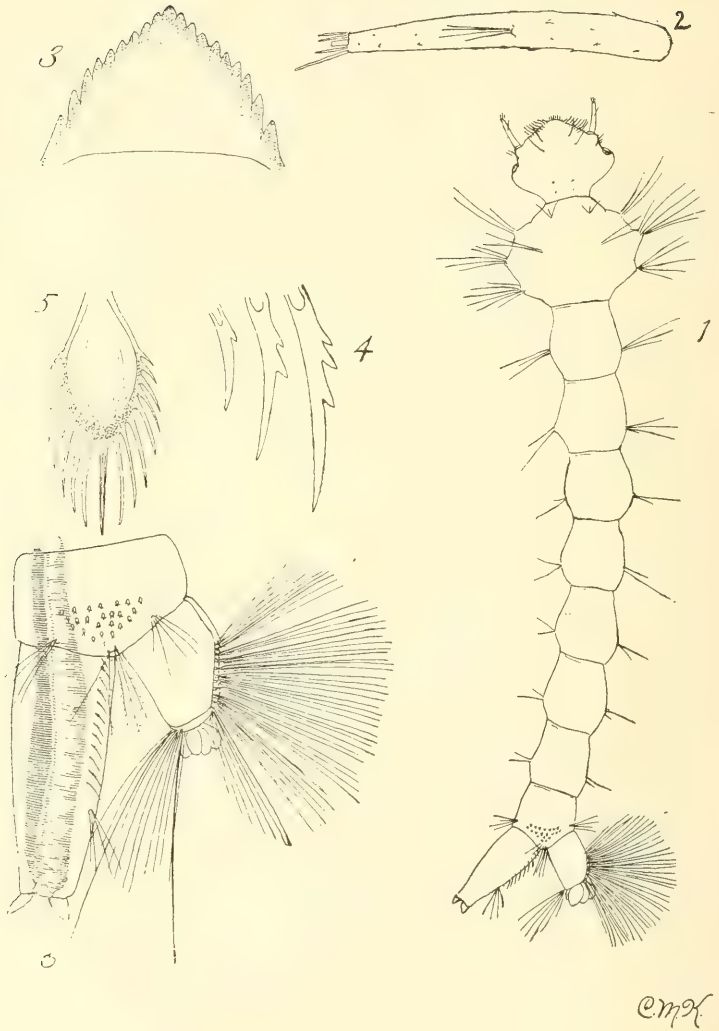


Figure 173 *Aedes squamiger*. Same parts as in figure 172

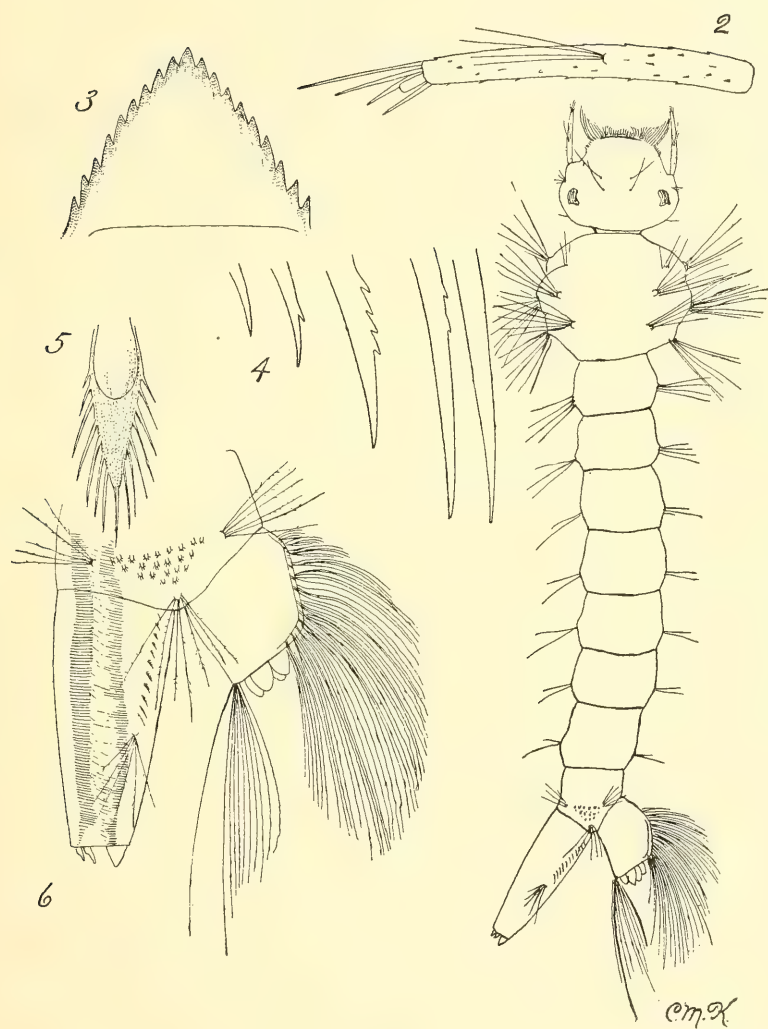


Figure 174 *Aedes quaylei*. Same parts as in figure 172.

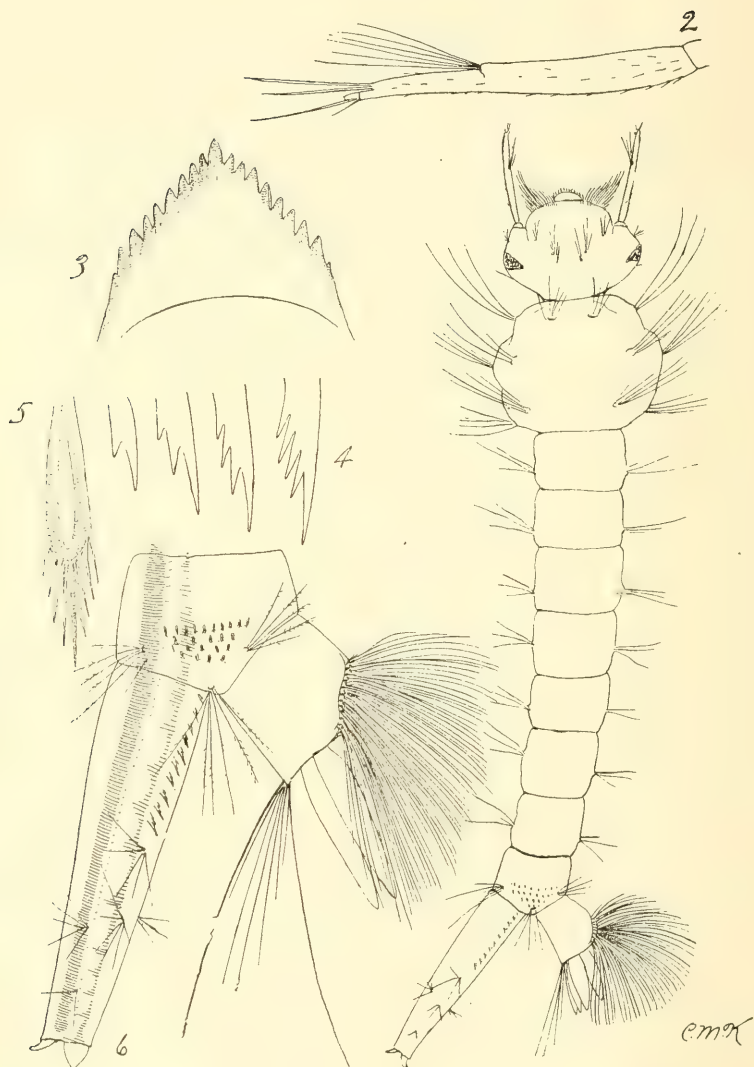


Figure 175 *Culex tarsalis*. Same parts as in figure 172.

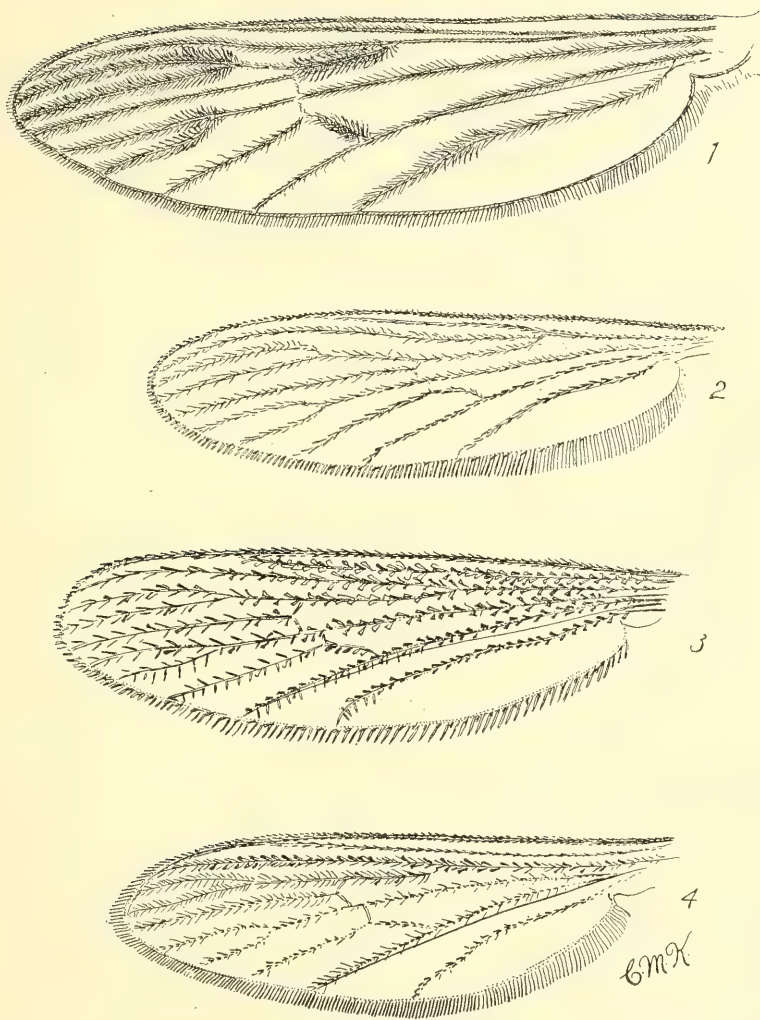


Figure 176 Wings of female mosquitoes. 1, *Culiseta incidens*; 2, *Culex tarsalis*; 3, *Aedes squamiger*; 4, *Aedes quaylei*.



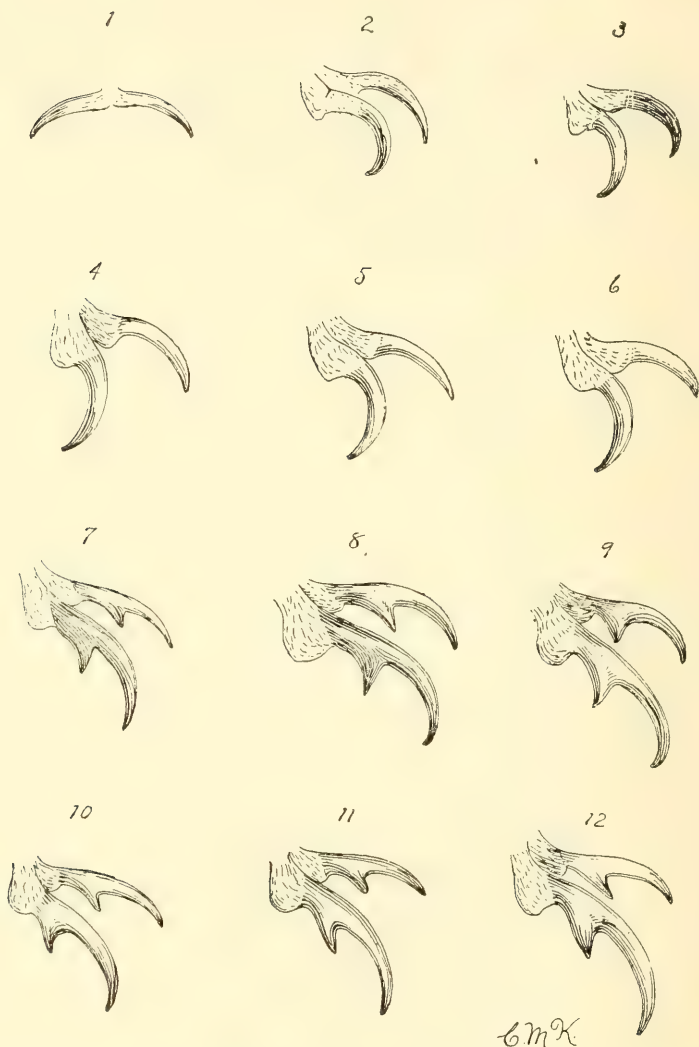


Figure 177 Claws of Mosquitoes. 1 - 3 *Culex tarsalis*; 4 - 6 *Culiseta incidens*; 7 - 9 *Aedes squamiger*; 10 - 12 *Aedes quaylei*.

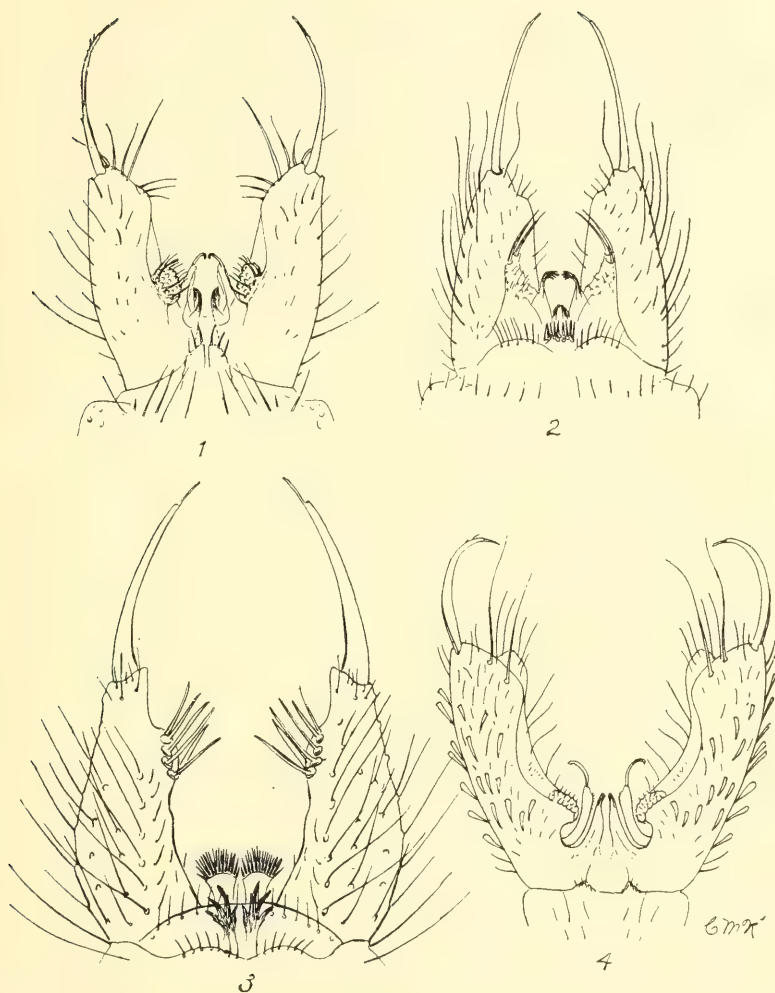


Figure 178. Genitalia. 1, *Ædes quaylei*; 2, *Culiseta incidens*; 3, *Culex tarsalis*; 4, *Ædes squamiger*.

*sylvestris*—*Aedes*.  
*tarsalis* Coq.  
*territans* Walk.  
*Culiseta consobrina*—*inornata*.  
*incidens* (Thom.)  
*inornata* (Wil.)

*maccrackenæ* D.&H.  
*Grabhamia currei*—*Aedes*.  
*demiedmanii* Lnd.  
*Leptoplatys squamiger*—*Aedes*.  
*sylvestris*—*Aedes*.  
*Mansonia signifer* Coq.

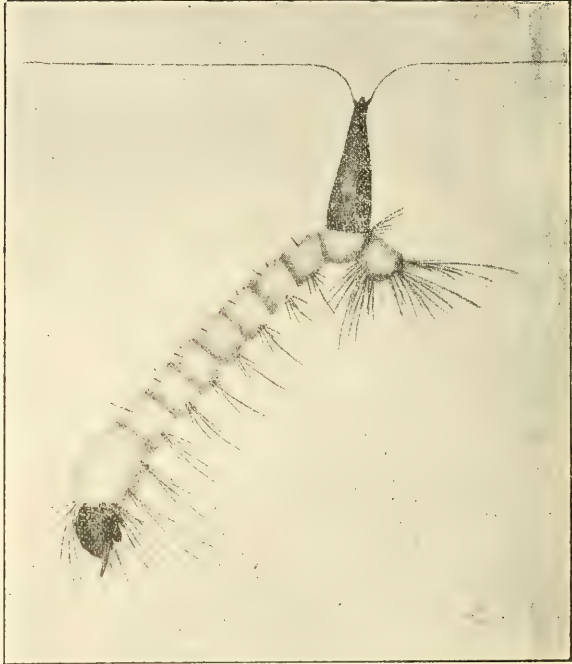


Figure 179 Culiseta larva.



Figure 180 Anopheles larva.

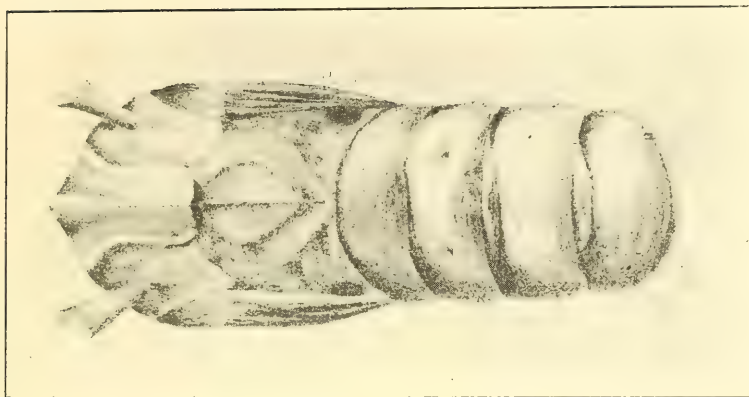


Figure 181 *Culiseta*. Back view.

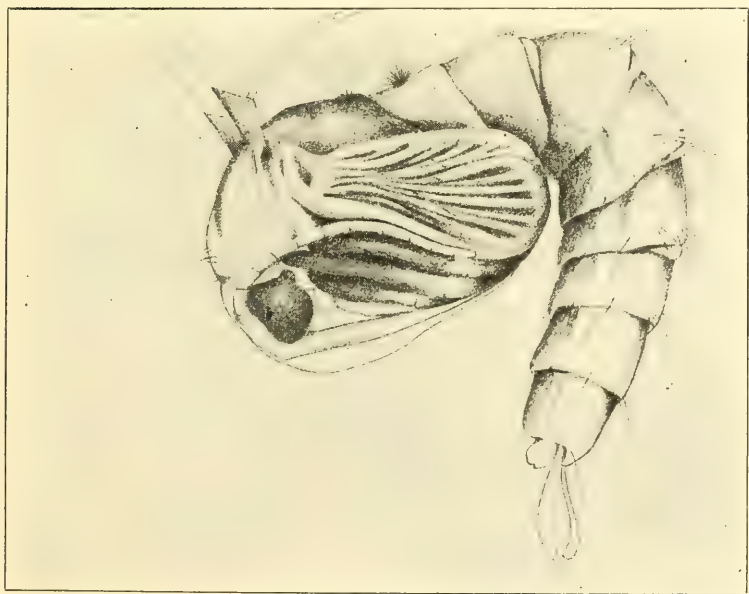


Figure 182 *Culiseta*. Side view.

varipalpus— <i>Aedes</i> .	sylvestris— <i>Aedes</i> .
<i>Ochlerotatus lativittatus</i> — <i>Aedes</i> Cur-	varipalpus— <i>Aedes</i> .
riei.	<i>Psophora ciliata</i> (Fabr.)

*Stegomyia calopus*—*Ædes*.  
*Theobaldia annulatus* Schrank.  
*incidens*—*Culiseta*.

*Tæniorhynchus sierrensis*—*Aedes var-*  
*ipalpus*.  
*Uranotænia anhydor* Dyer.

#### TENDIPEDIDÆ.

Larvæ, aquatic.  
*Eretmoptera browni* Kel.

*Paraclunio trilobatus* Kief.

#### PSYCHODIDÆ.

The larvæ feed on decaying vegetable substances.

*Pericoma bipuncta* Kin.  
*californica* Kin.  
*californiensis*—*californica*.  
*truncata* Kin.

*Psychoda cinerea* Banks.  
*pacifica*—*cinerea*.

*Scorax lanceolata*—*Trichomyia*.  
*Trichomyia lanceolata* (Kin.)

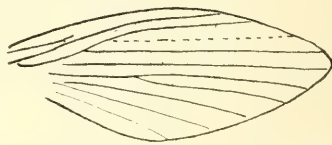


Figure 183 Venation of Psychodidæ.

#### TIPULIDÆ.

The larvæ of the long legged crane flies called leather jackets are sometimes abundant enough to do serious injury to the roots of plants.

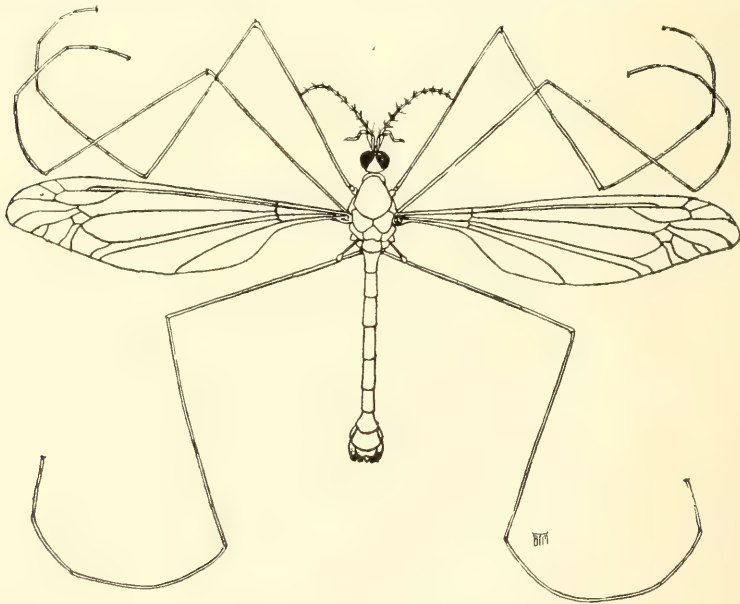


Figure 184 Tipulid fly.



*Amalopsis calcar* O.S.  
*Bittacomorpha clavipes* Fabr.  
*Ctenophora angustipennis* Low.  
*Dicranomyia badia* (Walk.)  
     *marmorata* O.S.  
     *stigmata* Doane.  
     *obscura* O.S.  
*Dicranoptycha sobrina* O.S.  
*Elliptera clausa* O.S.  
*Eriocera californica* O.S.  
     *obscura* Wil.  
*Erioptera bipartita* O.S.  
     *dulcis* O.S.  
*Geranomyia canadensis* (Westw.)  
*Helobia punctipennis* Meig.  
*Holorusia rubiginosa* Loew.  
*Idioplata vipio* O.S.  
*Limnobia badia*—*Dicranomyia*.  
     *californica* O.S.  
     *punctipennis*—*Helobia*.  
     *sciophila* O.S.  
*Limnibiorhynchus canadensis*—*Geranomyia*.  
*Limnophila damula* O.S.  
     *luteipennis* O.S.  
     *montana* O.S.  
*Molophilus forcipula* O.S.  
*Pachyrhina ferruginea* Fabr.  
*Pachyrhina ferruginea* (Fabr.)  
     *Wulpiana* Berg.  
*Pedicia obtusa* O.S.  
*Phylolabis claviger* O.S.  
     *encausta* O.S.

*Protoplasta vipio*—*Idioplata*.  
*Ptychoptera lenis* O.S.  
*Raphidolabis debilis* Wil.  
*Symplecta punctipennis*—*Helobia*.  
*Tipula acuta* Doane.  
     *betula* O.S.  
     *bituberculata* Doane.  
     *clavipes*—*Bittacomorpha*.  
     *fallax* Loew.  
     *ferruginea*—*Pachyrhina*.  
     *graphica* Doane.  
     *precisa* Loew.  
     *pubera* Loew.  
     *simplex* Doane.

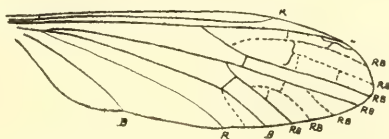


Figure 185 Venation of Tipulidae.

*spermax* O.S.  
     *subtilis* Doane.  
     *tristis* Doane.  
*Trichocera trichoptera* O.S.  
*Trimicra anomala* O.S.  
     *pallipes*—*Anomala*.

## PULECINA

### PULECIDÆ.

The fleas have come to very great prominence since the relation of *L. cheopus* to bubonic plague has been demonstrated. Most of the species are found only on rodents, but *C. canis* and *P. irritans* are important household pests.

*Anomiopsyllus californicus* Bak.  
*Ceratopsyllus acutus* Bak.  
     *anisus* Roth.  
     *californicus* Bak.  
     *ciliatus* Bak.  
     *fasciatus* Bosc.  
     *ignotus* Bak.  
     *londiniensis* Roth.  
     *multidentatus* Fox.  
     *niger* Fox.

*proximus* Bak.  
     *sexdentatus* Bak.  
     *telchium* Roth.  
*Corypsylla ornatus* Fox.  
*Ctenocephalus canis* Curt.  
     *felis* Roth.  
*Ctenophthalmus heiseri* McC.  
*Ctenopsyllus musculi* Duges.  
*Hoplopsyllus anomalus* Bak.  
*Læmopsylla cheopsis* Roth.

*Odontopsyllus charlottensis* Bak.

*wymani* Fox.

*Pulex cheopsis*—*Læmopsyllus*.

*irritans* Linn.

*pallidus*—*Læopsylla cheopsis*.

#### SARCOPSYLLIDÆ.

The chicken flea is occasionally abundant and annoying.

*Echidnophaga gallinacea* Westw.

## COLEOPTERA.

Numerically the Coleoptera is far in the lead of all other groups. Half the species of insects are beetles. The order contains about 40 per cent. of all the species of animals and approximately a quarter of all living beings both plants and animals.

Historically the group stands intermediate between the older orders of insects and the higher groups. Beetles are the culmination of the tendency seen in the Orthoptera and Hemiptera to produce a fully armored insect, a consummation reached only after the securing of complex metamorphosis which was also the antecedent condition permitting the specializations of structure characterizing the Diptera, Hymenoptera and Lepidoptera.

Structurally the Coleoptera are distinguishable by the concurrent specialization of front wings and abdomen whereby the ventral portion of the latter became enlarged joining with the former, enclosing a cavity into which the spiracles open and within which the second pair of wings lie folded. Both of these structures are absolutely distinctive of this order.

Economically beetles fall into a very secondary rank. While many are plant feeders, the great majority feed on decaying organic matter or are predaceous.

The classification of beetles was formerly largely based upon the number of joints in the foot, more recently the significance of the venation has been recognized.

The system adopted in this book is the use of a series of superfamilies as follows:—

1. Carabina, 2. Tenebrionina, 3. Meloina, 4. Elaterina, 5. Cantharina, 6. Clerina, 7. Hydrophylina, 8. Scarabæina, 9. Curculionina, 10. Chrysomelina, 11. Coccinellina, 12. Nitidulina, 13. Dermestina, 14. Heterocerina, 15. Histerina, 16. Trichopterygina, 17. Silphina, 18 Staphylinina.

The classification of Leconte and Horn, which has been generally followed

in this country is given below with the numbers of the superfamilies.

Coleoptera. (genuina).

Isomera.

Adephaga. — 1.

Clavicornia. — 7, 11, 12, 13, 14, 15, 16, 17 and 18.

Serricornia. — 4, 5 and 6.

Lamellicornia. — 8.

Phytophaga. — 10.

Heteromera. — 2 and 3.

Rhynchophora. — 9.

The latest German system, that of Reiter is as follows:—

Adephaga. — 1.

Polyphaga.

Staphylinoidea.

Staphylinida. — 18

Necrophaga. — 17.

Ptiligia. — 16.

Histerida. — 15.

Lamellicornia. — 8.

Palpicornia. — 7.

Diversicornia.

Hygrophi. — 14.

Clavicornia. — 11 and 12.

Brachymera. — 13.

Sternoxia. — 4.

Malacodermata. — 5.

Teredilia. — 6.

Heteromera. — 2 and 3.

Phytophaga. — 10.

Rhynchophora. — 9.

#### SYNOPSIS OF FAMILIES.

**Staphylinidæ**: abdomen exposed and horny above. **Clavigeridæ**: antennæ less than six-jointed. **Pselaphidæ**: abdomen inflexible.

**Carabidæ**: hind legs with large egg-shaped trochanter, and legs not fitted for swimming. **Cicindelidæ**: antennæ on the front. **Amphizoidæ**: metasternum truncate behind. **Halipidæ**: hind coxæ covering base of legs.

**Tenebrionidæ**: hind feet four-jointed, others five-jointed, antennæ not clubbed, front coxal cavities closed behind. **Alleculidæ**: claws pectinate. **Ægialitidæ**: six ventral segments.

**Curculionidæ**: feet four-jointed, antennæ clubbed and either head with a distinct beak, or gular sutures wholly confluent or obliterated. **Ipidæ**: elytra surrounding edge of pygidium. **Otiorhynchidæ**: with scar at tip of mandible. **Calandridæ**: with pygidium undivided in the male. **Rhynchitidæ**, **Rhinomacer-**

idæ and Anthribidæ: with antennæ straight and ventral segments free, the first without labrum and the second with prosternal sutures distinct.

**Chrysomelidæ:** feet apparently four-jointed, the fourth joint very minute

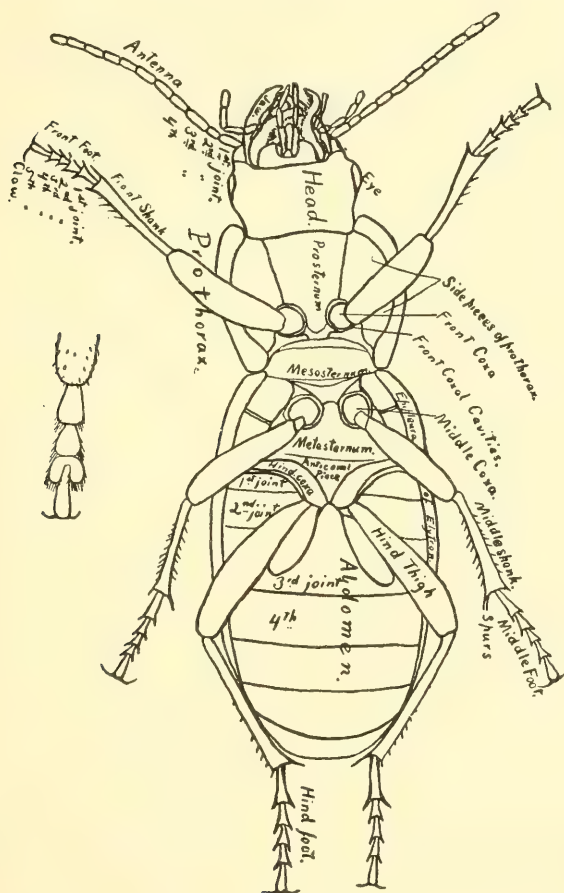


Figure 186 Structure of a beetle.

antennæ not distinctly clavate, shorter than legs.      **Lariidæ:** front long almost snout-like.

**Cerambycidae:** similar to Chrysomelidae but with long antennæ. (in doubtful cases the subcylindrical shape of body will aid in distinguishing this fam-



ily from the preceeding). **Spondylidæ**: feet slender.

**Malachiidæ**: body with extensile vesicles.

**Elateridæ**: prothorax with spine fitting deep into a cavity on mesosternum, anterior coxæ round and ventral segments free. **Throscidæ**: front coxal cavities open behind. **Cerophytidæ**: hind coxæ not entirely covering femora. **Eucnemidæ**: labrum concealed.

**Coccinellidæ**: feet three-jointed. **Sphæriidæ**: only three ventral segments. **Mydroscaphidæ**: antennæ eight-jointed. **Monotomidæ**: last ventral segment long. **Trichopterygidæ**: elytra truncate. **Endomychidæ**, **Ptiliidæ** and **Lathrididæ**: claws slender; the last two with feet slender, the last one with hind coxæ widely separated.

**Scarabæidæ**: antennæ lamellate. **Lucanidæ**: plates of antennæ immovable.

**Buprestidæ**: similar to Elateridæ, but first two ventral segments connate.

**Anthicidæ**: hind feet four-jointed, others five-jointed, antennæ not clubbed, hind coxæ prominent. **Monomidæ**: antennæ in grooves. **Cedemeridæ**, **Melandridæ** and **Pythidæ**: head not strongly constricted behind, the first with middle coxæ prominent, the last with thorax not margined. **Mordellidæ** and **Rhipiphoridæ**: thorax as wide as elytra, the latter with the lateral sutures of prothorax wanting.

**Histeridæ**: antennæ elbowed.

**Anobiidæ**: head retractile, tarsi five-jointed, abdominal segments five and front and middle coxæ round hind coxæ transverse. **Ptinidæ**: antennæ inserted on the front. **Lyctidæ**: first ventral segment elongate. **Psoidæ**: head prominent. **Bostrichidæ**: tibial spurs distinct.

**Hydrophilidæ**: legs paddle-shaped, antennæ clubbed.

**Dytiscidæ**: legs paddle-shaped. **Grynidæ**: front legs largest.

**Meloidæ**: hind feet four-jointed, others five-jointed, antennæ not clubbed.

**Cephaloidæ**: head elongate tapering behind. **Pyrochroidæ**: claws simple.

**Cantharidæ**: front coxæ round, abdomen with seven to nine segments. **Stylopidæ**: antennæ: not over six-jointed.

**Silphidæ**: hind coxæ prominent. **Melyridæ**: metasternum short. **Scydmaenidæ**: eyes coarsely granular. **Clambidæ**: hind coxæ lamellate. **Anisotomidæ**: front coxal cavities closed behind

**Nitidulidæ**: front coxæ transverse. **Georyssidæ**: antennæ nine-jointed. **Heterochroidæ**: four abdominal segments connate. **Derodontidæ**, **Byrridæ**, **Nosodendridæ**, **Dryopidæ** and **Cupesidæ**: hind coxæ hollowed out to receive femora, the first with metasternum long, the second and third with it short, the third having prominent head, the fourth with fifth joint of tarsi as long as other joints combined. **Sphindidæ**: metasternum long. **Ostomidæ**: metasternum emarginate behind. **Dascyllidæ**: with hind coxæ contiguous. **Helodidæ**: front coxa without trochantin.

**Dermestidæ**: metasternum small. **Byturidæ**: second and third tarsal joints lobed beneath.

**Cleridæ**: feet with membranous appendage beneath.

**Cucujidæ:** abdominal segments free. **Othniidæ:** front coxal cavities closed. **Scaphidiidæ:** with fifth abdominal segment longest. **Phalacridæ:** middle coxæ transverse. **Lymexylidæ:** head deflexed. **Corylophidæ:** six abdominal segments. **Monotomidæ, Endomychidæ, Cryptophagidæ** and **Ciidæ:** first ab-ing tarsi four-jointed with third joint very small, the last has all tarsi four-dominal segment longest, the first two with eyes transverse, the second hav-jointed. **Erotylidæ** and **Mycetophagidæ:** hind coxæ not nearly contiguous, the latter with anterior coxæ oval.

**Colydiidæ, Rhyssodidæ:** feet five jointed.

## CARABINA

### CICINDELIDÆ.

The tiger beetles are very active day flying, predaceous insects.

#### SYNOPSIS OF GENERA.

**Cicindela. Omus:** eyes small. **Tetracha:** third joint of maxillary palpi longer than fourth.

*Amblychile cylindriciformis* (not Calif.)

*piccolominii* (not Calif.)

*Cicindela californica—circumpicta.*

*cinctipennis* Lec.

*circumpicta* Laf.

*decemnotata* (not Calif.)

*depressula* Casey.

*duodecimguttata* (not Calif.)

*echo* Cas.

*eureka* Fall.

*fulgida* Say.

*gabii* Horn

*graminea—purpurea.*

*gravidus—hirticollis.*

*guttifera—oregona.*

*hyperborea* Lec. (not Calif.)

*hæmorrhagia* Lec.

*hirticollis* Say.

*imperfecta—pusilla.*

*latesignata* Lec.

*lauta—purpurea.*

*lemniscata* Lec.

*longilabris* Say.

*lunilonga* Schaupp.

*obliqua—vulgaris.*

*obsoleta* Say.

*oregona* Lec.

*pacifica—hæmorrhagica.*

*perviridis—longilabris.*

*plutonica—purpurea.*

*prætexta—circumpicta.*

*pseudosenilis—echo.*

*purpurea* Oliv.

*pusilla* Say.

*repanda* Dej.

*senilis* Horn.

*sierra—vulgaris.*

*sigmoidea—tortuosa.*

*sommeri* Mann.

*sperata* Lec.

*tenuisignata*, Lec.

*terricola—pusilla.*

*trifasciata—tortuosa.*

*rifasciata—tortuosa.*

*tuolumne—lunalonga.*

*vibex—vulgaris.*

*viridisticta* Bates.

*viridissima—vulgaris* Say.

*vulgaris* Say.

**Omus** *ambiguus* Schaupp.

*audouini* Reiche.

*californicus* Esch.

*confluens—sequoarum.*

*dejeani* (not Calif.)

*edwardsii* Crotch.

*elongatus—californicus.*

*hornii—sequoarum.*

*lævis* Horn.

*lecontei—californicus.*

*lugubris—edwardsii.*

*montanus—edwardsii.*

*punctifrons—sequoarum.*

*sculptilis—californicus.*

*sequoarum* Crotch.

*submetallicus* Horn.

**Tetracha** *carolina* Linn.

**CARABIDÆ.**

The Carabidæ are ground beetles, predaceous both as larvæ and adults.

## SYNOPSIS OF GENERA.

**Bembidium:** palpi with last joint slender and preceding joint enlarged. **Anillis:** eyes wanting. **Tachys** sutural stria recurved at apex.

**Pterostichus:** elytra with margin interrupted, with lateral plica and with dorsal punctures. **Psydrus** four joints of antennæ glabrous.

**Platynus:** elytra obliquely sinuate at tip. **Perigona:** antennæ thickened beyond third joint. **Calathus**, and **Læmosternus:** claws serrate, the latter with elytral punctures.

**Amara:** elytra with margin interrupted, with lateral plica and with two setigerous punctures over eye. **Nomius:** four joints of antennæ glabrous.

**Chlænius:** elytra with margin interrupted and with lateral plica. **Barchy-**

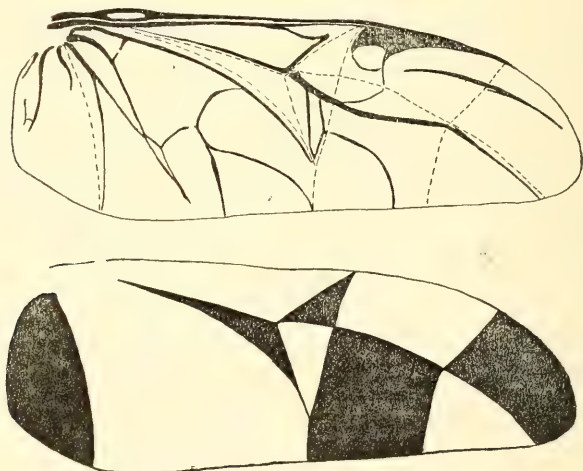


Figure 187 Wing of Carabid beetle. Black areas are reversed in folding.

**lobus:** mentum truncate in front.

**Calosoma:** palpi with last joint triangular and elytra not truncate. **Scaphinotus:** hind coxæ separated. **Carabus:** third joint of antennæ not compressed.

**Anisodactylus:** two setigerous punctures on each angle of clypeus. **Galerita:** elytra truncate.

**Dyschirus:** body depundulate. **Promecognathus:** hind coxæ separated. **Scarites:** basal joint of antennæ long. **Schizogenius:** front tarsi dilated. **Clivina:** thorax more or less quadrate, palpi similar in the sexes.

**Harpalus:** two basal joints of antennæ glabrous. **Babister:** labium unusually short. **Patrobus**, **Pogonus**, and **Trechus:** with two setigerous punctures

over the eyes, the last with terminal joint of palpi acute, the second with head constricted behind the eye. **Nothopus**: outer angle of front tibia prolonged. **Discorderus** and with middle tibia arcuate and serrate within. **Stenolophus**, **Bradycellus**, and **Agonoderus**: penultimate joint of palpus bisetose, the first with front and middle tarsi of male bilobed, the last with mentum not toothed. **Stenomorphus**: body subpedunculate.

**Lebia**: elytra truncate at tip. **Pseudomorpha**: head with antennal grooves beneath. **Brachynus**: one setigerous puncture over eye. **Zuphium**, **Dia-phorus** and **Thalpius**: penultimate joint of palpus pleurisetose, the first with narrow neck, the last with body subpedunculate. **Ega**: hind coxæ separated. **Casnonia**: head elongate. **Tetragonoderus**: tibia spurs long. **Dromius**, **Apristus**, **Blechrus**, **Axinopalpus**, **Technophilus**, **Callida**, **Apenes**, **Cymidis**, **Pinacodera**, **Plochinus**, and **Philophuga**: head not constricted behind the eyes, the first four with tarsi slender, the fourth with labial palpi thickened, the third and seventh with thorax lobed at base, the second and fifth with claws simple, the sixth with fourth tarsal joint bilobed, the eighth with coxæ hairy above, the ninth with terminal joint of palpi cylindrical, the tenth with base of thorax squarely truncate.

**Enebria**: antennæ with four basal joints glabrous. **Euphorticus**, **Lachnophorus**, and **Opisthius**: with two setigerous punctures over the eye, the first two with apices of elytra rounded, the first without elytral punctures. **Omophron**: scutellum concealed. **Loricera**: antennæ free at base. **Metrius**: elytra not margined. **Notiophilus**, front tibia very obliquely truncate. **Leistes**: mandibles explate at sides.

**Elaphrus**. **Trachypachus**: elytra not margined at base. **Diplochilla** and **Psydus**: elytra striate, the latter with two dorsal punctures.

- |   |   |
|---|---|
| <b>Agonoderus lineola</b> Fabr.           | <b>jacobina</b> Lec.                                    |
| <b>pallipes</b> Fabr.                     | <b>laticornis</b> Kirby.                                |
| <b>rugicollis</b> — <b>pallipes</b> .     | <b>longula</b> Lec.                                     |
| <b>Agonosma californicum</b> (not Calif.) | <b>rectangula</b> Lec.                                  |
| <b>Agonum brevicale</b> Loxandrus.        | <b>remotestriata</b> Dej.                               |
| <b>famelicum</b> — <b>Platynus</b> .      | <b>robustula</b> Horn.                                  |
| <b>Amara foveolata</b> Hay.               | <b>scitula</b> Zimm.                                    |
| <b>aurata</b> Dej.                        | <b>stupida</b> Lec.                                     |
| <b>blanchardi</b> Hay.                    | <b>Anchomenus brunneomarginatus</b> — <b>Platynus</b> . |
| <b>brunnipes</b> Mots.                    | <b>ferrugineus</b> — <b>Platynus</b> .                  |
| <b>californica</b> Dej.                   | <b>maurus</b> — <b>Platynus</b> .                       |
| <b>conflata</b> Lec.                      | <b>ovipennis</b> — <b>Platynus</b> .                    |
| <b>erratica</b> Sturm.                    | <b>rugiceps</b> — <b>Platynus</b> .                     |
| <b>fallax</b> Lec.                        | <b>Anillus debilis</b> Lec.                             |
| <b>farcta</b> Lec.                        | <b>explanatus</b> Horn.                                 |
| <b>gibba</b> Lec.                         | <b>Anisodactylus alternans</b> — <b>porosus</b> .       |
| <b>imitatrix</b> Horn.                    | <b>amaroides</b> Lec.                                   |
| <b>impuncticollis</b> Say.                | <b>brevicollis</b> Lec.                                 |
| <b>inepta</b> — <b>erratica</b> .         | <b>brunneus</b> Dej.                                    |
| <b>insignis</b> Dej.                      | <b>californicus</b> Dej.                                |
| <b>insularis</b> Horn.                    | <b>confusus</b> (undetermined).                         |
| <b>interstitialis</b> Dej.                |   |

- consobrinus Lec.  
 dilatatus Dej.  
 flebilis Lec.  
 hirsutus (undetermined).  
 immanis Horn.  
 irregularis Mots.  
 nivalis Horn.  
 obtusus Lec.  
 piceus Lec.  
 pilosus Horn.  
 pitychorus Lec.  
 porosus Mots.  
 rudis—porosus.  
 semipunctatus Lec.  
 similis—semipunctatus.  
 strenuus Horn.  
 sublævis—porosus.  
 villosus—piceus.  
 viridescens—porosus.  
 Anisotarsis flebilis—Anisodactylus.  
 Apenes limbata (undetermined).  
     nebulosa Lec.  
 Aphelogenia bilineata—Lebia.  
     furcata—Lebia.  
     guthula—Lebia.  
 Apristus laticollis Lec.  
     cordicollis Lec.  
 Axinopalpus biplagiatus (Dej.)  
     californicus—biplagiatus.  
     fusciceps Lec.  
 Badister anthracinus Lec.  
     ferrugineus Dej.  
     submarinus (undetermined).  
 Bembicidium anthostictum (undet.)  
 Bembidium acutifrons Lec.  
     anguliferum (Lec.)  
     approximatum (Lec.)  
     assimile Gyll.  
     bifasciatum (Mots.)  
     bifossulatum (Lec.)  
     breve Mots.  
     brevistriatum Hay.  
     californicum Hay.  
     cautum (Lec.)  
     carinatum Lec.  
     coloradense—dentellum.  
     complanulum (Man.)  
     concinnum—perconcinnum.  
     concolor (Kirby.)  
     connivens (Lec.)  
     consanguineum Hay.  
     crurale—dubitans.  
     dentellum (Thumb.)  
     dubitans Lec.  
     dyschirinum Lec.  
     ephippiger (Lec.)  
     erosum—transversale.  
     falsum Bla.  
     flavicauda—Tachys.  
     flavipictum—pictum.  
     fuchsii Blais.  
     fumatum Mots.  
     funereum Lec.  
     grandicolle (Lec.)  
     henshawii Hay.  
     hesperum Fall.  
     horni Hay.  
     humboldtensis Blais.  
     incertum (Mots.)  
     incrementum—dentellum.  
     indistinctum Dej.  
     insulatum (Lec.)  
     intermedium (Kirby).  
     irrescens (Lec.)  
     laterimaculatum (undetermined).  
     laticeps (Lec.)  
     littoralei—hesperum.  
     longulum (Lec.)  
     lucidum (Lec.)  
     lugubre Lec.  
     mæklini (not California).  
     mexicanum (not California)  
     mormon Hay.  
     mundum—bifasciatum.  
     musciola Hay.  
     nanus—Tachys.  
     nebraskense Lec.  
     nevadense Ulke.  
     nigripes—variegatum.  
     nigroceruleum Hay.  
     nitidum (Kirby.)  
     nubiculosum Chaud.  
     obliquum—nitidum.  
     oblongum (Man.)  
     obtusangulum Lec.  
     parallelum (undetermined).  
     pictum Lec.  
     planatum Lec.  
     planisculum Man.  
     platynoides Hay.  
     politum (undetermined).  
     perconcinnum Bla.  
     pumilus—Tachys.  
     quadrioveatum Man.  
     reticulatum Lec.  
     rickseckeri Hay.  
     scudderii Lec.  
     sculpturatum Mots.  
     sordidulum Chaud.  
     sordidulum—timidum.



- spectabile (Man.)  
 striola Lec.  
 subinfaltum (uidetermined).  
 suspectum—dentellum.  
 tigrinum Lec.  
 timidum—versicolor.  
 transversale Dej.  
 trechiforme (Lec.)  
 vandykei Blais.  
 variegatum Say.  
 variolosum Mots.  
 versicolor (Lec.)  
 vile (Lec.)  
 whitneyi Fall.  
 wickhami Hay.  
 zephyrum Fall.  
**Blechrus** glabratus (undetermined).  
 nigrinus (Man.)  
**Bomius** lucidus—**Blechrus**.  
**Brachylobus** californicus (undet.)  
 caurinus Horn.  
**Brachynus** carinulatus Mots.  
 costipennis Mots  
 fidelis Lec.  
 lateralis Dej.  
 tschernikhii Man.  
**Bradycellus** californicus Lec.  
 cognatus Gyll.  
 nebulosus Lec.  
 nitens—cognatus.  
 nubifer—ruprestris.  
 rivalis Lec.  
 ruprestris Say.  
 symmetricus Mots.  
 ventralis—ruprestris.  
**Bradytus** latior—**Amara**.  
**Brennus** cordatus—**Scaphinotus**.  
 cristatus—**Scaphinotus**.  
 dissolutus—**Scaphinotus**.  
 interruptus—**Scaphinotus**.  
 obliquus—**Scaphinotus**.  
 porcatus—**Scaphinotus**.  
 striatopunctatus—**Scaphinotus**.  
 striatus—**Scaphinotus**.  
**Calathus** behrensii—ruficollis.  
 obscurus Lec.  
 quadricollis—ruficollis.  
 ruficollis Dej.  
**Calleida** croceicollis—**Technophilis**.  
**Callida** platynoides Horn.  
 Callisthenes discors—**Calosoma**.  
**Calosoma** ænescens Lec.  
 angulatum (not California).  
 calidum (not California).  
 cancellatum Esch.  
 deitzii Sch.  
 discors Lec.  
 eremicola Fall.  
 latipenne Horn.  
 luxatum Say.  
 parviceps Cas.  
 parvicollis Fall.  
 peregrinator Guer.  
 prominens Lec.  
 rugosipennis Sch.  
 scrutator Fabr.  
 semilæve Lec.  
 simplex Lec.  
 subæneum Chaud..  
 tepidum Lec.  
 triste Lec.  
 tristoides—triste.  
**Carabus** californicus (undescribed).  
 dentellum—**Bembidium**.  
 serratus (not California).  
 tædatus Fabr.  
 truncaticolle (not California).  
**Casnonia** pennsylvanica (not Calif.)  
 picta Chaud.  
**Celia** aurata—**Amara**.  
 californica—**Amara**.  
 fæcta—**Amara**.  
 gibba—**Amara**.  
 imitatrix—**Amara**.  
 interstitialis—**Amara**.  
 purpurescens—**Amara**.  
 rectangula—**Amara**.  
 remotestriata—**Amara**.  
 robustula—**Amara**.  
**Chlænius** asperulus—variabilipes.  
 cumatilis Lec.  
 cursor Chev.  
 glaucus Lec.  
 harpalinus Esch.  
 leucoscellis Chev.  
 nebraskensis (not California).  
 obsoletus Lec.  
 pennsylvanicus Say.  
 pubescens—pennsylvanicus.  
 regularis—sericeus.  
 rogator Mots.  
 ruficauda Chaud.  
 sericeus Forst.  
 smlimilus Chaud.  
 solitarius Say.  
 sparsus Lec.  
 tricolor Dej.  
 variabilipes Esch.  
 viridifrons Esch.  
**Clivina** dentipes Dej.

- punctulata* Lec.  
*Coptodera piceus*—*Dromius*.  
*Cychrus alternatus*—*Scaphinotus striatopunctatus*.  
   *angusticollis*—*Scaphinotus*.  
   *basalis*—*Scaphinotus cristatus*.  
   *catenulatus*—*Scaphinotus mimus*.  
   *compositus*—*Scaphinotus interruptus*.  
   *constrictus*—*Scaphinotus interruptus*.  
   *convergens*—*Scaphinotus obliquus*.  
   *cordatus*—*Scaphinotus*.  
   *corpulentus*—*Scaphinotus interruptus*.  
   *crenulatus*—*Scaphinotus ventricosus*.  
   *cristatus*—*Scaphinotus*.  
   *decipiens*—*Scaphinotus striatopunctatus*.  
   *dissolutus*—*Scaphinotus interruptus*.  
   *duplicatus*—*Scaphinotus cristatus*.  
   *fuchsianus*—*Scaphinotus ventricosus*.  
   *gentilis*—*Scaphinotus ventricosus*.  
   *gravidus*—*Scaphinotus punctatus*.  
   *hoppingi*—*Scaphinotus oreophilus*.  
   *incipiens*—*Scaphinotus rugiceps*.  
   *interruptus*—*Scaphinotus*.  
   *lativentris*—*Scaphinotus ventricosus*.  
   *longipes*—*Scaphinotus angusticollis*.  
   *mimus*—*Scaphinotus*.  
   *obliquus*—*Scaphinotus*.  
   *oreophilus*—*Scaphinotus*.  
   *opacicollis*—*Scaphinotus obliquus*.  
   *ovalis*—*Scaphinotus striatopunctatus*.  
   *politus*—*Scaphinotus interruptus*.  
   *porcatus*—*Scaphinotus dissolutus*.  
   *punctatus*—*Scaphinotus*.  
   *riversii*—*Scaphinotus oreophilus*.  
   *rugiceps*—*Scaphinotus incipiens*.  
   *sculptipenne*—*Scaphinotus obliquus*.  
   *sinuatus*—*Scaphinotus interruptus*.  
   *striatopunctatus*—*Scaphinotus*.  
   *striatus*—*Scaphinotus ventricosus*.  
   *subtilis*—*Scaphinotus*.  
   *symetricus*—*Scaphinotus ventricosus*.  
   *truncaticollis*—*Scaphinotus*.  
   *velutinus*—*Scaphinotus angusticollis*.  
   *ventricosus*—*Scaphinotus*.  
   *ventricosus*—*Scaphinotus*.  
*Cymidis abstrusa* (not California).  
   *amena*—*Philophaga*.  
   *biplagiatus*—*Axinopalpus*.  
   *californica*.  
   *cribricollis* (not California).  
   *laticollis* Say.  
   *planipennis* (not California).  
   *punctigera*—*Pinacodera*.  
   *viridis*—*Philophaga*.  
*Cyrtotus blancaardi*—*Amara*.  
   *californicus*—*Amara*.  
   *jacobina*—*Amara*.  
   *evipennis*—*Amara*.  
   *stupidus*—*Amara*.  
*Diaphorus rufus*—*Thalpius*.  
   *tenuicollis* Lec.  
*Diplochila impressicollis* Dej.  
*Discoderus americanus* (not Calif.)  
   *amoenus* Lec.  
   *cordaticollis* Horn.  
   *crassicollis* Horn.  
*Dromius biplagiatus*—*Axinopalpus*.  
   *nigrinus*—*Blechnus*.  
   *piceus* (Dej.)  
*Dischirius æneus* Dej.  
   *æneolus* Lec.  
   *analys* Lec.  
   *aratus* Lec.  
   *basalis* Lec.  
   *consobrinus* Lec.  
   *gibbipennis* Lec.  
   *intiger*—*æneus*.  
   *lævifasciatus* (not California).  
   *marinus*—*obesus*.  
   *patruelis* Lec.  
   *obesus* Lec.  
   *salivagans* Lec.  
   *terminatus* Lec.  
   *tridentatus* Lec.  
   *truncatus* Lec.  
   *unipunctatus* Fall.

- viridens* Fall.  
*Ega lætula* Lec.  
*Elaphrus californicus*—*riparius*.  
     *clairvillei* Kirby.  
     *lævigatus* Lec.  
     *lecontei* Cr.  
     *pallipes* Horn.  
     *politus*—*lævigatus*.  
     *riparius* Linn.  
     *viridis* Horn.  
*—ipus lævissimus*—*Promecognathus*.  
*Eurytrichus debilis*—*Anisodactylus*.  
*Euphorticus occidentalis* Horn.  
*Galerita californica*—*lecontei*.  
     *lecontei* Dej.  
*Glycerius intermedius* Fall.  
     *nitidus* (Dej.)  
     *politus* Fall.  
     *obtus* Fall.  
*Haplochile pygmaea*—*Nomius*.  
*Harpalus albionicus* Man.  
     *alternans* (undetermined).  
     *caliginosus* Fabr.  
     *carbonarius* Lec.  
     *cautus* Dej.  
     *compar*—*pennsylvanicus*.  
     *depressicollis* (undetermined).  
     *fraternus* Lec.  
     *hirsutus* (undetermined).  
     *pennsylvanicus* DeG.  
     *porcus* Mots.  
     *somnulentus* DeG.  
     *ventralis* Lec.  
     *vespertinus* Cas.  
*Holciophorus ater*—*Pterostichus*.  
     *serripes*—*Pterostichus*.  
*Hyperphas caligans*—*Pterostichus*.  
     *inanis*—*Pterostichus*.  
*Lachnophorus elegantulus* Man.  
*Læmostenus complanatus* (Dej.)  
*Lebia angulata* (undetermined).  
     *bilineata* Mots.  
     *cupripennis* (not California).  
     *cyanipennis* Dej.  
     *cyanella* Lec.  
     *furcata* (Lec.)  
     *goniodera* Gem.  
     *guttula* (Lec.)  
     *majuscula* Chaud.  
     *ornata* Say.  
     *ruficollis*—*cyanipennis*.  
     *viridis* Say.  
*Leistus ferrugineus* Man.  
*Linnæum laticeps*—*Harpalus*.  
*Lymnæum laticeps*—*Bembidium*.  
*Loricera cærulescens*—*pilicornis*.  
     *californica*—*semipunctata*.  
     *foveata* Lec.  
     *pilicornis* Fabr.  
     *semipunctata* Esch.  
*Loxandrus micans* (not California).  
*Loxopeza majuscula*—*Lebia*.  
*Lymnæum laticeps*—*Bembidium*.  
*Metabletus nigrinus*—*Blechrus*.  
*Metrius contractus* Esch.  
*Nebria diversa* Lec.  
     *eschscholtzia* Mer.  
     *ingens* Horn.  
     *metallica* (not California).  
     *ovipennis* Lec.  
     *rathvoni* Lec.  
     *sahlbergi* (not California).  
     *virescens* Chaud.  
*Nomius pygmæus* Dej.  
*Notaphus incertus*—*Bembidium*.  
*Notiophilus obscurus* Fall.  
     *semistriatus* (not California).  
     *semiopacus* Esch.  
     *sylvaticus* Esch.  
*Notopus grossus*  
*Ochthedromus angulifera*—*Bembidium*.  
     *approximatus*—*Bembidium*.  
     *bifosulatum*—*Bembidium*.  
     *cautum*—*Bembidium*.  
     *connivens*—*Bembidium*.  
     *dubitans* *Bembidium*.  
     *ephippiger*—*Bembidium*.  
     *grandicollis*—*Bembidium*.  
     *insulatus*—*Bembidium*.  
     *iridescens*—*Bembidium*.  
     *longulus*—*Bembidium*.  
     *lucidus*—*Bembidium*.  
     *striola*—*Bembidium*.  
     *timidus*—*Bembidium*.  
     *trechiforme*—*Bembidium*.  
     *versicolor*—*Bembidium*.  
     *vile*—*Bembidium*.  
*Omophron dentatum* Lec.  
     *gilæ* (not California).  
     *ovale* Horn.  
*Opisthius richardsoni* Kirby.  
*Pasimachus californicus* (not Calif.)  
     *mexicanus* (not California)  
     *vividans* (not California).  
*Patrobus californicus* Mots.  
     *septentrionis* Dej.  
*Pelophila californica* (not California).  
*Pemphus angusticollis*—*Scaphinotus*.  
*Pericompsus sellatus*—*Tachys*.  
*Perigona nigriceps* Dej.

- Peryphus complanulus*—*Bembidium*.  
*concolor*—*Bembidium*.  
*nitidum*—*Bembidium*.  
*parallelocolle*—*Bembidium*.  
*subinflatus*—*Bembidium*.  
*Philophuga amœna* (Lec.)  
*castanea* Horn.  
*viridis* (Dej.)  
*Philotechnus croceicollis*—*Technophilus*.  
*nigricollis*—*Technophilus croceicollis*.  
*ruficollis*—*Technophilus croceicollis*.  
*Pinacodera punctigera* (Lec.)  
*semisulcata* (Lower California).  
*sulcipennis* (Lower California).  
*Platynus agilis* Lec.  
*bicolor*—*brunneomarginatus*.  
*bicoloratus* Gem.  
*brevicollis*—*frater*.  
*brunneomarginatus* (Man.)  
*bogemanni* Gyl.  
*californicus* Lec.  
*cinctellus*—*brunneomarginatus*.  
*cupripennis* Say.  
*cupreus* Dej.  
*deplanatus* Lec.  
*extensicollis* Say.  
*familicus*—*fossiger*.  
*ferruginosus* Dej.  
*fossiger* Dej.  
*fragilis*—*agilis*.  
*frater* Lec.  
*funebis* Lec.  
*jejunus* Lec.  
*larvalis* (not California).  
*maculicollis* Lec.  
*maurus* Mots.  
*micans*—*funebis*.  
*ovipennis* Man.  
*obsoletus*—*bogemanni*.  
*piceolus* Lec.  
*planipennis*—*fossiger*.  
*quadratus* Lec.  
*rugiceps*—*brunneomarginatus*.  
*simplex*—*extensicollis*.  
*striatus* Dej.  
*subsericeus*—*cupripennis*.  
*sulcatus* Dej.  
*tenebricosus* Gem.  
*variolatus* Lec.  
*Plochionus timidus* Hald.  
*Pœcilus amplicollis*—*Pterostichus*.  
*cursor*—*Pterostichus occidentalis*.  
*occidentalis*—*Pterostichus*.  
*splendidulus*—*Pterostichus*.  
*subcordatus*—*Pterostichus*.  
*Pogonus depressus* (not California).  
*planatus* Horn.  
*Platysma adstrictum*—*Pterostichus* or-  
*angustum*—*Pterostichus*.  
*curtipenne*—*Pterostichus*.  
*longicollis*—*Pterostichus gracilior*.  
*luczati*—*Pterostichus*.  
*oregonum*—*Pterostichus*.  
*parallellum*—*Pterostichus Purpuratus*.  
*planctum*—*Pterostichus*.  
*puncticollis*—*Pterostichus lustrans*.  
*vicinum*—*Pterostichus*.  
*vitreum*—*Pterostichus*.  
*Pristonychus complanatus*—*Læmostenus*.  
*inaequalis* (undetermined.)  
*Promecognathus crassus*—*lævissimus*.  
*lævissimus* Chaud.  
*Pseudomorpha cronkhitei* Horn.  
*behrensii* Horn.  
*Psydrus piceus* Lec.  
*Pterostichus algidus*—*validus*.  
*amethystinus* Dej.  
*angustus* Dej.  
*ater* Dej.  
*brunneus* (not California).  
*californicus* Dej.  
*caligans* Horn.  
*castanipes* Men.  
*cejugenda* (not California).  
*congestus* Men.  
*contractus*—*castanipes*.  
*crenicollis* Lec.  
*curtipenne* (undetermined).  
*fuchsi* Sch.  
*gracilis* (undetermined).  
*gracilior* Lec.  
*herculeus* Man.  
*hornii* Lec.  
*inanis* Horn.  
*inermis* Fall.  
*isabellæ* Lec.  
*lætulus* Lec.  
*longicollis*—*gracilior*.  
*luczoti* (not California).  
*lustrans* Lec.

- californicus—*Pterostichus*.  
 menestriesii Mots.  
 morionides Chaud.  
 muticus (not California).  
 occidentalis (Dej.)  
 oregonus (not California).  
 orinomum (Leach.)  
 ovicollis Sch.  
 parallelus—*protractus*.  
 planctus Lec.  
 protractus Lec.  
 purpuratus (not California).  
 scutellaris Lec.  
 serripes (Lec.)  
 splendidulus Lec.  
 subcordatus Lec.  
 tarsalis Lec.  
 validus Dej.  
 vicinus Lec.  
 vitreus (not California).  
*Scaphiodactylus micans*—*Loxandrus*.  
*Scaphinotus angusticollis* Fisch.  
     *behrensi* Roesch.  
     *cordatus* (Lec.)  
     *incipiens*—*rugiceps*.  
     *interruptus* (Man.)  
     *mimus* (Horn.)  
     *obliquus* (Lec.)  
     *oreophilus* (Riv.)  
     *punctatus* (Lec.)  
     *rugiceps* Horn.  
     *striatopunctatus* (Chaud.)  
     *subtilis* (Schaum.)  
     *ventricosus* Dej.  
*Scarites subterraneus* Fabr.  
*Schizogenius crenulatus* Lec.  
     *depressus* Lec.  
     *litigiosus*—*depressus*.  
     *pluripunctatus* Lec.  
     *seticollis* Fall.  
*Selenophorus opalinus* (not Calif.)  
     *palliatu*s Fabr.  
*Stenolophus anceps* Lec.  
     *californicus* Lec.  
     *cincticollis* Lec.  
     *coniunctus* Say.  
     *flavipes* Lec.  
     *limbalis* Lec.  
     *ochropezus* Say.  
     *tener* Lec.  
     *unicolor* Dej.  
*Stenomorphus californicus* Mots.  
*Tachycellus cognatus*—*Bradycellus*.  
     *conformis* Fall.  
     *nigrinus* Dej.  
     *nitidus*—*Glycerius*.  
*Tachys anthrax* Lec.  
     *audax* Lec.  
     *corax* Lec.  
     *edax* Lec.  
     *falli* Hay.  
     *flavicauda* Say.  
     *latipennis* Hay.  
     *mordax* Lec.  
     *nanus* (Gyll.)  
     *obesulus* Lec.  
     *pumilis* Dej.  
     *rapax* Lec.  
     *rivularis*—*nanus*.  
     *rufotestaceus* Hay.  
     *sellatus* Lec.  
     *virgo* Lec.  
     *vittiger* Lec.  
     *vorax* Lec.  
*Trachypechys gibsii* Lec.  
     *inermis* Mots.  
*Technophilis croceicollis* (Men.)  
     *nigr'collis*—*croceicollis*.  
*Tenystola striata*—*Platynus*.  
     *sulcata*—*Platynus*.  
*Tetragonoderus fasciatus* Hald.  
     *pallidus* Horn.  
     *undulatus*—*fasciatus*.  
*Thalpius rufulus* Lec.  
     *hornii* Chaud.  
*Trechus barbaræ* Horn.  
     *californicus*—*chalybeus*.  
     *chalybeus* Dej.  
     *lævigatus*—*ovipennis*.  
     *oblongulum*—*Bembidium*.  
     *ovipennis* Mots.  
     *pomonæ* Fall.  
     *spectabile*—*Bembidium*.  
*Triæna foveolata*—*Amara*.  
     *longula*—*Amara*.  
     *scitula*—*Amara*.  
*Zuphium longicollis* Lec.

HALIPLIDÆ.

- Brychius hornii* Cr.  
*Cnemidotus callosus* Lec.  
     *simplex* Lec.  
*Haliplus concolor* Lec.  
     *longulus* Lec.  
     *ruficollis* DeG.



## AMPHIZOIDÆ.

*Amphizoa insolens* Lec.

## GYRINIDÆ.

This family consists of the surface feeding water beetles called "whirligig bugs" because of their very peculiar habit of swimming. They are predaceous also in the larva stage living at the bottom.

*Dyneutes sublineatus* (not California).

*Gyretes sinuatus* Lec.

*Gyrinus affinis* Aube.

*confinis* Lec.

*parvus* Say.

*consobrinus* Lec.

*fuscipes* (undetermined).

*marginiventris*—*plicifer*.

*plicifer* Lec.

## DYTISCIDÆ.

The beetles of this family are aquatic and predaceous.

*Acilius laticinctus*—*Thermonectes bas-*

*latusculus*—*semisulcatus*.

*simplex*—*semisulcatus*.

*semisulcatus* Aube.

*Agabinus glabrellus* Mots.

*Agabus austenii* Sharp.

*brevicollis* (Lec.)

*confertus* (Lec.)

*discolor*—*lecontei*.

*erichsoni* (undetermined).

*intersectus* (Crotch).

*lecontei* (Crotch.)

*lineellus* (Lec.)

*lugens* Lec.

*lutosus*—*lugens*.

*morosus* (Lec.)

*morulus* Lec.

*nigroæneus* Er.

*obliteratus* (Lec.)

*obsoletus* (Lec.)

*perplexus*—*suturalis*.

*semivittatus* (not California).

*strigulosus* (Crotch).

*suturalis* (Crotch).

*tristis* Aube.

*Bidessus affinis* Say.

*amandus* Lec.

*cinctellus* (Lec.)

*nigrinus* Casey.

*pictodes* Sharp.

*plicipennis* (Crotch).

*subtilis* (Lec.)

*Cœlambus hydropicus* Lec.

*lutescens* Lec.

*medialis* Lec.

*Colymbetes anthrax* Lec.

*colloseus* Lec.

*densus* Lec.

*divisus* Aube.

*fossiger*—*Agabus morosus*.

*glabrellus* Mots.

*inæqualis*—*seminiger*.

*sculptilis* Harr.

*seminiger* Lec.

*sobrinus*—*Agabus nigroæneus*.

*strigatus* Lec.

*Copelatus chevrolatii* Aube.

*Coptotomus interrogatus* Fabr.

*Cybister ellipticus* Lec.

*explanatus* Lec.

*Cymatopterus inæqualis* Horn.

*Dernectes depressus* Fabr.

*griseostriatus* DeG.

*striatellus* (Lec.)

*Desmopachra latissima* (Lec.)

*Dytiscus anxius*—*circumcinctus*.

*circumcinctus* Lec.

*fuscostriatus*—*circumcinctus*.

*marginicollis* Lec.

*sublimbatus* Lec.

*Eretes sticticus* Linn.

*Gaurodytes brevicollis*—*Agabus*.

*conferatus*—*Agabus*.

*intersectus*—*Agabus*.

*lecontei*—*Agabus*.

*lineellus*—*Agabus*.

*lugens*—*Agabus*.

*morosus*—*Agabus*.

*obsoletus*—*Agabus*.

*semivittatus*—*Agabus*.

*strigulosus*—*Agabus*.

*suturalis*—*Agabus*.

*tristis*—*Agabus*.

*Graphoderes cinereus* Linn.

*occidentalis* Horn.

*Hydaticus mormonatus*—*Thermonectes*.

*stagnalis* Fabr.

*Hydroporus addendus* Crotch.

affinis—*Bidessus*.  
 amandus—*Bidessus*.  
 axillaris Lec.  
 cinetellus—*Bidessus*.  
 eximius Mots.  
 fortis Lec.  
 fraternus Lec.  
 funereus Crotch.  
 griseostriatus—*Deronectes*.  
 hardyi Sharp.  
 hydropicus—*Hygrotus*.  
 impressifrons Mots.  
 latebrosus Lec.  
 latissimus—*Desmopachra*.  
 lutescens Lec.  
 medialis—*Coelambus*.  
 mexicanus Sharp.  
 maculavis—affinis.  
 obesus—rivalis Gyll.  
 obscurellus—affinis.  
 palliatus Horn.  
 parallelus Lec.  
 perplexus—tenebrosus.  
 punctinatus Horn.  
 plicipennis—*Bidessus*.  
 pulcher Mots.  
 quadrimaculatus Horn.  
 rivalis Gyll.  
 striatellus—*Deronectes*.

subpubescens Lec.  
 subtilis—*Bidessus*.  
 tenebrosus Lec.  
 terminalis Sharp.  
 vilis Lec.  
*Hydrovatus brevipes* Sharp.  
*Hygrotus hydropicus* (Lec.)  
*Hydrotrupes palpalis* Sharp.  
*Ilybiusoma regularis* Lec.  
 decipiens Lec.  
 difficilis Horn.  
*Laccophilus atristernalis* Crotch.  
 fasciatus Aube.  
*Laccophilus atristernalis*—mexicanus.  
 quadrilineatus Horn.  
 terminalis Sharp.  
 truncatus Mots.  
*Rhantus anisonynchus* Crotch.  
 binotatus Har.  
 consimilis Mots.  
 discedens—tostus.  
 divisis Aube.  
 flavogriseus Crotch.  
 sinuatus Lec.  
 tostus Lec.  
*Thermonectes basilaris* Horn.  
 intermedius—basilaris.  
 marmoratus Lec.

*Clinidium calcaratum* Lec.

#### RHYSSODIDÆ.

*Rhyssodes hamatus* Lec.

*Cupes lobiceps* Lec.

#### CUPESIDÆ.

serrata—*Priacma*.

*Priacma serrata* Lec.

### TENEBRIONINA

#### OTHNIIDÆ

*Elacatis longicornis*—*Othnius*.

*guttulatus* Lec.

#### LAGRIIDÆ.

*Statira subnitida* Lec.

#### TENEBRIONIDÆ

A family of beetles most abundant in arid regions. They feed on dead vegetable matter, a few attacking stored food products.

*Adelina lecontei* Horn.

*Alphitobius ovatus* Cas

*Alaphrus riparius* Linn.

piceus Oliv.

*Alaudes singularis* Horn.

*Alphitophagus bifasciatus* (Say).

- Amphidora attenuata*—*Helops*.  
*littoralis* Esch.  
*Anædus rotundicollis*  
*Anemia californica* Horn.  
*Anepsius atratus* Cas.  
*bicolor* Cas.  
*catenulosus* Cas.  
*deficiens* Cas.  
*nebulosus* Cas.  
*Aphanotus brevicornis* Lec.  
*Apocrypha anthicoides* Esch.  
*clavinoides* Horn.  
*dyschirioides* Lec.  
*Aræoschizus armatus* Horn.  
*costipennis* Lec.  
*exiguus* Cas.  
*simulans* Cas.  
*sulcicollis* Horn.  
*Argoporis bicolor* (Lec.)  
*costipennis* (Lec.)  
*inconstans* Horn.  
*sulcipennis*—*costipennis*.  
*Asida actuosa* Horn.  
*ægrola* Lec.  
*angulata* Lec.  
*capitosa* Horn.  
*carinata* Lec.  
*confluens* Lec.  
*gabbii* Horn.  
*hispidula* Lec.  
*hirsutus* Lec.  
*impetrata* Horn.  
*lecontei* Horn.  
*lirata* Lec.  
*luctata* Horn.  
*marginata* Lec.  
*morbillosa* Lec.  
*muricatula* Lec.  
*obovata* (Lec.)  
*obsoleta* Lec.  
*parallela* (Lec.)  
*sordida* Lec.  
*Auchmobius sublævis* Lec.  
*Batuliodes rotundicollis* (Lec.)  
*Batulius rotundicollis*—*Batuliodes*.  
*setosus* Lec.  
*Bius estriatus* Lec.  
*Blapstinus æqualis* Cas.  
*angusta* Lec.  
*brevicollis* Lec.  
*californicus* Mots.  
*coronadensis* Cas.  
*crassus*—*Ulus*.  
*dilatatus* Lec.  
*discolor* Horn.  
*fuliginosus* Cas.  
*funebri* Cas.  
*gregalis* Cas.  
*inquisitus* Cas.  
*lecontei* Muls.  
*longulus* Lec.  
*parallelus* Cas.  
*pubescens* Lec.  
*pulverulenta* Man.  
*rufipes* Cas.  
*sordidus*—*Trichoton*.  
*sulcatus* Lec.  
*validus* Cas.  
*Calcar estriatus*—*Bius*.  
*Centrioptera asperata* Horn.  
*caraboides*—*spiculifera*.  
*muricata* Lec.  
*seriata* (Lec.)  
*spiculifera* Lec.  
*Centronopus parallelus* Lec.  
*Cerencspus armatus* Lec.  
*bicolor*—*Argoporus*.  
*concolor* Lec.  
*costipennis*—*Argoporus*.  
*costulatus* Horn.  
*Chilometopon abnorme* (Horn.)  
*castaneum* Cas.  
*helopoides*—*Prometopium*.  
*Cibdelis bachei* Lec.  
*blaschkii* Man.  
*lævigatus* Cas.  
*Cenemeplatia sericea* Horn.  
*Cnemodus testaceus* Horn.  
*Cœlocnemis californica* Man.  
*dilaticollis* Man.  
*magna* Lec.  
*obesus* Lec.  
*rugosa* Cas.  
*Cœlomorpha maritima* Cas.  
*Cœlus amplicicollis* Cas.  
*avenarius* Cas.  
*ciliatus* Esch.  
*curtulus* Cas.  
*debilis* Cas.  
*globulosus* Lec.  
*grossus* Cas.  
*latus* Cas.  
*longulus* Cas.  
*obscurus* Cas.  
*pacificus* Cas.  
*remotus* Cas.  
*saginitus* Cas.  
*scolopax* Cas.  
*solidus* Cas.  
*sternalis* Cas.  
*Conibius elongatus* Horn.

- parallelus* Lec.  
*seriatus* Lec.  
*Coniontellus argutus* Cas.  
*Coniontellus abdominalis*. Lec  
*affinis* Lec.  
*agrestis* Cas.  
*anexa* Cas.  
*atronitens* Cas.  
*audax* Cas.  
*avenarius* Cas.  
*blaisdelli* Cas.  
*callida* Cas.  
*canonica* Cas.  
*carsonica* Cas.  
*conferata* Cas.  
*congesta* Cas.  
*conicollis* Cas.  
*convergens* Cas.  
*cuneata* Cas.  
*curtulus* Cas.  
*cylindrica* Cas.  
*cylindrica* Cas.  
*elongata* Cas.  
*degener* Cas.  
*elliptica—robusta*.  
*eschscholtzii* Man.  
*exigua* Cas.  
*expansa* Cas.  
*extricata* Cas.  
*faralonica* Cas.  
*filiola* Cas.  
*franciscana* Cas.  
*genitiva* Cas.  
*globulina* Cas.  
*gravis* Cas.  
*grossus* Cas.  
*inæqualis* Cas.  
*inconspicua* Cas.  
*inflexula* Cas.  
*innocua—elongata*.  
*insularis* Cas.  
*elongata* Cas.  
*inornata* Cas.  
*integer* Cas.  
*lassenica* Cas.  
*lata* Lec.  
*latus* Cas.  
*levetti* Cas.  
*limatala* Cas.  
*longicollis* Cas.  
*lucidula* Cas.  
*marginata* Cas.  
*microsticta* Cas.  
*minuta* Cas.  
*montana* Cas.  
*nemoralis* Esch.  
*nevadensis* Cas.  
*obsidiana* Cas.  
*opaca* Horn.  
*opacicollis* Cas.  
*pacificus* Fall.  
*pagana* Cas.  
*pallidicornis* Cas.  
*parallela* Cas.  
*parva* Cas.  
*parviceps* Cas.  
*pauperculus* Cas.  
*pectoralis* Cas.  
*perpolita* Cas.  
*perspicua* Cas.  
*picipes* Cas.  
*protensa* Cas.  
*pudica* Cas.  
*puncticollis* Lec.  
*remotus* Fall.  
*robusta* Horn.  
*rotundicollis* Cas.  
*punctipes* Cas.  
*rugosa* Cas.  
*shastanica* Cas.  
*sparsa* Cas.  
*strenua* Cas.  
*subpubescens* Esch.  
*suturalis* Cas.  
*suturalis* Cas.  
*symmetrica* Cas.  
*tenebrosa* Cas.  
*tenuis* Cas.  
*thoracica* Cas.  
*timida* Cas.  
*tristis* Cas.  
*truncata* Cas.  
*verna* Cas.  
*viatica* Esch.  
*Craniotus pubescens* Lec.  
*osculans* Lec.  
*Cyanæus angustus* Lec.  
*depressus* Horn.  
*Cryptadius inflatus* (Lec.)  
*oviformis* Cas.  
*punctipennis* Cas.  
*Cryptoglossa lævis* Lec.  
*seriata—Centrioptera*.  
*nigropilosa* Lec.  
*osculans—Cratidius*.  
*rufipes—Stenotrichius*.  
*tenebrosa* (lower California).  
*verrucosa* Lec.  
*Dacoderus striaticeps* Lec.  
*Doliema plana* Fabr.

- Echocerus cornutus**—**Gnathocerus**.  
     **maxillosus** Fabr.  
**Edrotes angusticollis** Cas.  
     **nitidulus** Cas.  
     **ventricosus** Lec.  
**Eleates explanatus** Cas.  
     **occidentalis** Cas.  
**Eleodes acuticauda** Lec.  
     **aspera**—**granulata**.  
     **armata** Lec.  
     **behrii** Grim.  
     **blanchardii** Blai.  
     **clavicornis** Esch.  
     **catalinæ**—**omissa**.  
     **communis** **omissa**.  
     **confinis**—**dentipes**.  
     **connexa** Lec.  
     **consobrina** Lec.  
     **constrictor**—**parvicollis**.  
     **cuneaticollis** Cas.  
     **dentipes** Esch.  
     **depressa**—**Embaphion**.  
     **distans**—**gracilis**.  
     **elegans**—**dentipes**.  
     **elongata**—**dentipes**.  
     **elongata**—**grandicollis**.  
     **emarginata**—**omissa**.  
     **estriata**—**gigantea**.  
     **farallonica**—**parvicollis**.  
     **femorata**—**militaris**.  
     **fischeri**—**marginata**.  
     **fuchsii** Blai.  
     **gentilis**—**gigantea**.  
     **gigantea** Man.  
     **gracilis** Lec.  
     **grandicollis** Man.  
     **granulatomuricata**—**humeralis**.  
     **granosa** Lec.  
     **granulata** Lec.  
     **hirsuta** Lec.  
     **hispidabris** Say.  
     **hoppingii** Blai.  
     **hornii** Blai.  
     **humeralis** Lec.  
     **impotens**—**armata**.  
     **impressicornis**—**clavicornis**.  
     **inculta** Lec.  
     **intermedia**—**behrii**.  
     **intermedia**—**cordata**.  
     **interrupta**—**omissa**.  
     **intricata**—**cordata**.  
     **lævis**—**dentipes**.  
     **laticollis**—**acuticauda**.  
     **lecontei** Horn.  
     **letcheri** Blai.  
     **longipilosa** Horn.  
     **marginata** Esch.  
     **militaris** Horn.  
     **minor**—**acuticauda**.  
     **muricata**—**humeralis**.  
     **nana**—**tenebrosa**.  
     **neotomæ** Blai.  
     **nigrina** Lec.  
     **obscura** Say.  
     **obtusa**—**granulata**.  
     **omissa** Lec.  
     **ordinata**—**pilosa**.  
     **parvicollis** Esch.  
     **parvula**—**letcheri**.  
     **peninsularis**—**omissa**.  
     **pertenuis**—**dentipes**.  
     **pilosa** Horn.  
     **pimelioides** Man.  
     **planata**—**parvicollis**.  
     **producta**—**parvicollis**.  
     **prominens**—**dentipes**.  
     **punctata**—**acuticauda**.  
     **punctata**—**dentipes**.  
     **pygmæa**—**omissa**.  
     **quadricollis** Esch.  
     **reflexicollis** Man.  
     **robusta**—**dentipes**.  
     **scabipennis** Lec.  
     **scabricula** Lec.  
     **scabrosa** Esch.  
     **sculptilis**—**hispidabris**.  
     **stricta**—**cordata**.  
     **subaspersa**—**lecontei**.  
     **sublævis**—**cordata**.  
     **subnitens** Lec.  
     **sulcipennis**—**obscura**.  
     **tarsalis**—**quadricollis**.  
     **tenebrosa** Horn.  
     **tuberculata**—**cordata**.  
     **tuberculata**—**granulata**.  
     **tuberculata**—**humeralis**.  
     **valida**—**grandicollis**.  
     **vandulæ**—**letcheri**.  
     **veseyi** Lec.  
     **vicina** Lec.  
**Eleodimorpha volcan** Blai.  
**Embaphion pderessum** Lec.  
     **elongatum** Horn.  
**Emmenastus ater**—**Melanastus**.  
     **crassicornis**—**Melanastus**.  
     **longulus**—**Hylocrinus**.  
     **nanulus**—**Melanastus** **obesus**.  
     **obesus**—**Melanastus**.  
     **obtusus**—**Melanastus**.  
     **piceus**—**Hylocrinus**.



- thoracicus* *Melanastus*.  
*Epitragus pruinosis*—*Metopoloba*.  
     *submetallicus*—*Polemiotus*.  
*Esophus castaneus*—*Eupsophus*.  
*Eulabis bicarinatus* *Esch.*  
     *crassicornis* *Cas.*  
     *grossa* *Lec.*  
     *laticornis* *Cas.*  
     *obscurus* *Lec.*  
     *pubescens* *Lec.*  
     *rufipes* *Esch.*  
*Eupsophus castaneus* *Cas.*  
*Eurymetopon abnorme*—*Metopium*.  
     *atrum*—*Emmenastus*.  
     *bicolor* *Horn.*  
     *convexicolle*—*Metopium*.  
     *cylindricum*—*Metopium*.  
     *inflatum*—*Cryptadium*.  
     *longulum*—*Emmenastus*.  
     *obesus*—*Emmenastus*.  
     *ochraceum*—*convexicolle*.  
     *sodalis*—*Telabis*.  
     *rufipes* *Esch.*  
     *sodalis*—*Telabis incisa*.  
*Eusattus agnatus* *Cas.*  
     *convexus* *Cas.*  
     *coquilletti* *Lin.*  
     *cristatus* *Horn.*  
     *difficilis* *Lec.*  
     *dilatatus* *Lec.*  
     *dubius* *Lec.*  
     *erplanatus* *Cas.*  
     *erosus* *Horn.*  
     *lævis* *Lec.*  
     *muricatus* *Lec.*  
     *nanus* *Cas.*  
     *politus* *Horn.*  
     *oblongus* *Cas.*  
     *productus* (*Lec.*)  
     *puberulus* *Lec.*  
     *robustus* *Lec.*  
*Euschides liratus*—*Asida*.  
     *obovatus*—*Asida*.  
*Gnathocarus cornutus* *Fabr.*  
*Helops angustus* *Lec.*  
     *antennatus* *Lec.*  
     *bachei* *Lec.*  
     *blaisdelli* *Cas.*  
     *californicus* *Man.*  
     *discipula* *Cas.*  
     *edwardsii* *Horn.*  
     *opacus* *Lec.*  
     *ovipennis* *Cas.*  
     *punctatus* *Gem.*  
     *punctipennis* *Lec.*  
     *rugulosus* *Lec.*  
     *strigicollis* *Horn.*  
     *tumescens* *Lec.*  
*Hylocrinus blaisdelli* *Cas.*  
     *depressulus* *Cas.*  
     *filitarsis* *Cas.*  
     *longulus* (*Lec.*)  
     *oblongulus* *Cas.*  
     *piceus* (*Cas.*)  
*Hypophleus opaculus* *Lec.*  
     *substriatus* *Lec.*  
*Iphthimus lævissimus* *Cas.*  
     *serratus* *Man.*  
*Lioderma cacti* *Lec.*  
     *grandi* *Mars.*  
*Locrodes oblongulus*—*Hylocrinus*.  
     *piceus*—*Hylocrinus*.  
*Megeleates sequoiarum* *Cas.*  
*Mecysmus angustus* *Lec.*  
*Melanastus æquicollis* *Cas.*  
     *ater* (*Lec.*)  
     *crassicornis* (*Cas.*)  
     *exoletus* *Cas.*  
     *lucidulus* *Cas.*  
     *mœstus* *Cas.*  
     *obesus* (*Lec.*)  
     *obtusus* (*Lec.*)  
     *otiosus* *Cas.*  
     *sterilis* *Cas.*  
     *thoracicus* (*Cas.*)  
     *vergrandis* *Cas.*  
*Merotemnus elongatus* *Horn.*  
*Metaclisa marginalis* *Horn.*  
*Metopium abnorme* (*Lec.*)  
     *convexicolle* (*Lec.*)  
     *cylindricum* (*Cas.*)  
     *edax* *Cas.*  
     *egregium* *Cas.*  
     *faustum* *Cas.*  
     *gravidum* *Cas.*  
     *granulosum* *Cas.*  
     *gulosum* *Cas.*  
     *insulare* *Cas.*  
     *intiger* *Cas.*  
     *molestum* *Cas.*  
     *opacipenne* *Cas.*  
     *probatum* *Cas.*  
     *tersum* *Cas.*  
     *testaceum* *Cas.*  
*Metopoloba californica* *Cas.*  
     *prumosa* (*Horn.*)  
*Micromas maritimus* *Cas.*  
     *ovipennis* (*Horn.*)  
*Microschatia inæqualis* *Lec.*  
     *puncticollis* *Lec.*  
*Mycotrogus angustus* *Horn.*  
*Nocibiotes gracilis* (*Cas.*)

- Noserus convexulus* Cas.  
*corrosus* Cas.  
*plicatus* (Lec.)  
*Nosoderma diabolicum*—*Phlæodes*.  
*plicatum*—*Noserus*.  
*porcatum*—*Phellopsis obcordata*.  
*pustulosum*—*Phlæodes diabolicus*.  
*Notibius gracilis*—*Nocibiotes*.  
*granulatus* Lec.  
*puberulus* Lec.  
*pubescens* Lec.  
*puncticollis* Lec.  
*sulcatus* Lec.  
*Nyctobates inermis*—*pensylvanica*.  
*pensylvanica* Del.  
*Nyctoporus æquicollis* Esch.  
*carinata* Lec.  
*cristata* Esch.  
*galeata*—*cristata*.  
*pullata* Cas.  
*sponsa* Cas.  
*tetrica* Cas.  
*Paleocyphorus costipennis*—*Asida sordida*.  
*Palorus melinus* Herb.  
*Pentaphyllus californicus* Horn.  
*Phareria debilis* Lec.  
*globosa* Lec.  
*humeralis* Cast.  
*limbalis* Horn.  
*pilifera* Lec.  
*rotundata* Lec.  
*montana* Cas.  
*Phalopsis obcordata*  
*montana* Cas.  
*Philonthus angulatus*—*Asida*.  
*carinatus*—*Asida*.  
*confluens*—*Asida*.  
*connivens*—*Asida*.  
*costipennis*—*Asida sordida*.  
*hirsutus*—*Asida*.  
*hispidus*—*Asida hispidula*.  
*marginatus*—*Asida*.  
*muricatus*—*Asida*.  
*obsoletus*—*Asida*.  
*parallelus*—*Asida*.  
*Phlæodes diabolicus* Lec.  
*remotus* Cas.  
*Phthora americana* Horn.  
*Phylethus bifasciatus*—*Alphitophagus*.  
*Platydemus angustus* Lec.  
*janus* Fabr.  
*oregonensis* Lec.  
*subquadrulm* Cas.  
*Polemiotus submetallicus* (Lec.)  
*Prometopion helopioides* (Horn.)  
*Schizillus laticeps* Horn.  
*Scotobænus parallelus*—*Centronopus*.  
*Sitophagus complanatus* Dei.  
*lecontei*—*Adelina*.  
*Stenotrichus rufipes* (Lec.)  
*Stibia maritima*—*Micromas*.  
*ovipennis*—*Micromas*.  
*Telabis fidelis* Cas.  
*incisa* Cas.  
*opacella* Cas.  
*sodalis* (Horn.)  
*Tenebrio estriatus*—*Bius*.  
*molitor* Linn.  
*obscurus* Fabr.  
*tenebroides* Beauv.  
*Tribolium confusum* Duv.  
*ferrugineum* Fabr.  
*Trimytis abnorme*—*Chilometopon*.  
*Triorhus gracilicornis* Cas.  
*lævis* Lec.  
*politus* Cas.  
*punctatus* Lec.  
*rugiceps* Lec.  
*subpubescens* Horn.  
*Trichoton sordidum* (Lec.)  
*Trogloclerus costatus* Lec.  
*tuberculatus* Blai.  
*Typhlusechus singularis* Lin.  
*nucleatus* Cas.  
*Uloa olivulata* Lec.  
*marginata*—*Metaclisa*.  
*Ulosonia marginata* Lec.  
*Ulus crassus* (Lec.)  
*Usechus lacerata* Mots.  
*Vacronus tenuicornis* Cas.  
*Zopherodes californicus* Cas.  
*parvicollis* Cas.  
*Zopherus grandicollis* Horn.  
*induratus* Cas.  
*nucieatus* Cas.  
*tristis* Lec.

## CISTELIDÆ.

- Allecula punctulata* Lec.  
*Cistela opaca* (Lec.)  
*punctulata*—*Allecula*.  
*serica* Say.  
*theveneti* Horn.  
*variabilis* Horn.  
*Hymerorus discrepans*  
*Prionychus cyaneus*—*Stenochidius*.

*Prostenus californicus* Horn.  
*Stenochidius cyanescens* (Lec.)  
*gracilis* Lec.

*robustus* Cas.  
*Xystropus californicus*  
*opacus*—*Cistela*.

## MELOINA

### MELOIDÆ.

The blister beetles are used in medicine. They feed on the foliage of plants and are sometimes quite injurious. The young larvæ are parasitic on bees and are called *triungulins* because of their trident-shaped claws. They have hypermetamorphoses.

### SYNOPSIS OF GENERA.

*Lytta*: antennæ with apical joints thickened. *Gnathium*: mandibles prolonged beyond labrum.

*Nemognatha*: mandibles prolonged beyond labrum. *Zonitus* outer lobe of maxillæ not prolonged.

*Epicauta*: lower portion of claws equal to upper. *Meloe*: elytra short. *Marrchbasis*: second joint of antennæ long.

*Calospasta*. *Cysteodemus*: elytra inflated. *Megetra*: elytra divergent from scutellum. *Porespasta*: elytra separating at tip. *Phodaga*: vertex elevated. *Tegrodera*: body glabrous.

*Calospasta elegans* (Lec.)

*fulleri* Horn.

*mirabilis* Horn.

*mœsta* Horn.

*nemognathoides* Horn.

*perpulchra* Horn.

*Cantharis æneipennis*—*Lytta*.

*auriculata*—*Lytta*.

*chalybeata*—*Lytta*.

*childii*—*Lytta*.

*choris*—*Lytta*.

*compressicornis*—*Lytta*.

*crotchii*—*Lytta*.

*cyanipennis*—*Lytta*.

*difficilis*—*Lytta*.

*dolorosa*—*Lytta stygica*.

*funerea*—*Lytta*.

*incommoda*—*Lytta*.

*infidelis*—*Lytta*.

*insperata*—*Lytta*.

*lugens*—*Lytta*.

*lugubris*—*Lytta*.

*magister*—*Lytta*.

*melæna* (Arizona.)

*mœrens*—*Lytta*.

*molesta*—*Lytta*.

*morosa*—*Lytta*.

*morosa*—*Lytta*.

*nigripilis*—*Lytta*.

*nitidicollis*—*Lytta*.

*oblita*—*Epicauta*.

*puncticollis*—*Epicauta*.

*purpurescens*—*Lytta*.

*rathvini*—*Lytta*.

*refulgens*—*Lytta*.

*smaragdula*—*Lytta stygica*.

*sphæricollis*—*Lytta*.

*stolida*—*Lytta*.

*stygica*—*Lytta*.

*tenebrosa*—*Lytta*.

*vulnerata*—*Lytta*.

*Cysteodermus armatus* Lec.

*wizlizeni* Lec.

*Epicauta alphonsii* Horn.

*elegans*—*Calospasta*.

*fallax* Horn.

*maculata* Say.

*maura* (Lec.)

*oblita* (Lec.)

*puncticollis* Man.)

*straba* Horn.

*Gnathium nitidum* Horn.

*Lytta æneipennis* Lec.

*atriventris*—*Macrobasis*.

*auriculata* Horn.

*chalybeata* (Gem.)

*childii* Lec.

*choris* (Fall).

compressicornis Horn.  
 crotchii (Horn).  
 cyanipennis Horn.  
 difficilis (Fall).  
 funerea (Fall).  
 incommoda (Horn).  
 infidelis (Fall).  
 insperata (Horn).  
 lugens Lec.  
 lugubris Ulke.  
 magister Horn.  
 maura—Epicauta.  
 moerens Lec.  
 molesta (Horn).  
 morosa (Fall).  
 nigripilis (Fall).  
 nitidicollis Lec.  
 oblita Epicauta.  
 puncticollis—Epicauta.  
 purpuriscens (Fall).  
 rathvoni Lec.  
 retulgens Horn.  
 sphæricollis (Say).  
 stolidia (Fall).  
 stygica (Lec.)

tenebrosa Lec.  
 vulnerata Lec.  
 Macrobasis fallax Horn.  
 Megetra opaca Horn.  
 Meioe barbarus Lec.  
 opacus Lec.  
 sublævis Lec.  
 strigulosus Man.  
 Nemognatha apicalis Lec.  
 cribraria Lec.  
 dichroa Lec.  
 dubia Lec.  
 immaculata Say.  
 lutea Lec.  
 nigripennis Lec.  
 piezata Fabr.  
 scutellaris Lec.  
 Nomaspis sublævis Horn.  
 Phodaga alticeps Lec.  
 Poreospasta polita Horn.  
 Tegrodera erosa Lec.  
 latecincta—erosa.  
 Zonitis flavida Lec.  
 vigilans Fall.

Dendroides picipes Horn.

#### PYROCHROIDÆ.

Pyrochroa californica Horn.

Amblyderus albicans

Anthicus amœnuc Cas.  
 amplicollis Boh.  
 annectens Lec.  
 atomarius Boh.  
 auriger Cas.  
 bellulus Lec.  
 biguttulus Lec.  
 californicus Laf.  
 cæsiusignatus Boh.  
 confinis Lec.  
 corticalis Lec.  
 cribratus Lec.  
 formicarius Laf.  
 hecate Cas.  
 helvinus Cas.  
 herifuga Cas.  
 horridus Lec.  
 inscitus Cas.  
 lugubris Laf.  
 luteolus Lec.  
 maritimus Lec.  
 mercurialis Cas.  
 militaris Cas.  
 nanus Lec.  
 nigrifolius Lec.

#### ANTHICIDÆ.

nitidus Boh.  
 nitidulus Lec.  
 obliquus Cas.  
 obscurellus Lec.  
 oviscollis Cas.  
 pinguescens Cas.  
 præceps Cas.  
 protectus Cas.  
 punctatulus Lec.  
 quadrilunatus Laf.  
 rufulus Lec.  
 seminotatus Cas.  
 squamosus Laf.  
 tenius—Baulius.  
 troglodytes Boh.  
 Baulius tenius Lec.  
 Crophyra abnormis Horn.  
 bardii Horn.  
 crotchii Horn.  
 distinguenda Horn.  
 flabellata Horn.  
 funebris Horn.  
 inconspicua Horn.  
 lequesii Horn.  
 monticola Horn.  
 punctulata Lec.

*vittata* Horn.  
*Eurygenius constricta* Lec.  
*Formicilla munda* Lec.  
*Hemantus enodis* Cas.  
     *floralis* (Linn.)  
*Lappus bipartitus* Cas.  
     *canonicus* Cas.  
     *cursor* Cas.  
     *nitidulus* Lec.  
     *pinalicus* Cas.  
     *turgidihollis* Cas.  
     *vigilans* Cas.  
*Mecynotarsus delicatulus* Horn.  
*Notoxus alamedæ* Cas.  
     *apicalis* Lec.  
     *calcaratus* Horn.  
     *cavicornis* Lec.  
     *conformis* Lec.  
     *constrictus* Cas.  
     *debilitans* Cas.  
     *denudatus* Horn.  
     *elegantulus*—*talpa*.  
     *humboldtii* Cas.  
     *lustrellus* Cas.  
     *monodon* Fabr.  
     *robustus* Cas.  
     *serratus* Lec.  
     *sparsus*—*conformis*.  
     *spatulifer* Cas.

*Asclera cana*—*Oxaxis*.  
     *bicolor*—*Oxaxis*.  
     *discolor* Lec.  
     *excavata* Lec.  
     *quadrinaculata* Mots.  
*Oxaxis bicolor* (Lec.)  
     *cana* (Lec.)  
     *pallida* (Lec.)

*Cononotus macer* Horn.  
     *punctatus* Lec.  
     *sericans* Lec.  
*Priognathus monilicornis* Rand.  
*Salpingus alternans* Lec.

*Myodites californicus* Lec.  
*Rhipiphorus cruentus* Germ.

*Anaspis atra* Lec.  
     *collaris* Lec.  
     *luteipennis*—*sericea*.  
     *sericea* Man.

*talpa* Laf.  
*Meloe floralis*—*Vacusus*.  
*Pedilus punctulatus*—*Corphyra*.  
*Phomalus saginatus* Cas.  
*Retocomus decorellus* Cas.  
     *gratus* Cas.  
*Thicanus californicus* Laf.  
     *franciscanus* Cas.  
*Vacusus confinus* Lec.  
     *nigritulus* Cas.  
*Sapintus corticalis* (Lec.)  
     *corticalis*—*Sapintus*.  
     *obesus* Cas.  
     *parviceps* Cas.  
     *gracilentus* Cas.  
     *salinus* Lec.  
*Stereopalpus incanus* Cas.  
     *indutus* Cas.  
     *impressicollis* Cas.  
     *nimius* Cas.  
     *pruinosis* Lec.  
     *subalbicans* Cas.  
     *variipes* Cas.  
*Tanarthropsis alutaceus* Lec.  
     *infernalis* Wic.  
     *inyo* Wic.  
     *brunnipennis* Lec.  
*Tanarthrus alutaceus* (Lec.)  
     *alutaceus*—*Tanarthrus*.

## CEDEMERIDÆ.

*pallida*—*Oxaxis*.  
*Ditylus cyanipennis* Horn.  
*Ischnomera excavata*—*Asclera*.  
*Nacerdes melanura* Linn.  
     *sericea* Horn.  
*Rhinoplatia ruficollis* Horn.  
*Xanthochroa californica* Horn.

## PYTHIDÆ.

*Spalma quadricollis* Horn.  
*Rhinosimus æneirostris* Mann.  
     *pallipes* Boh.  
*Trimitomerus riversii* (not California).

## RHIPIPHORIDÆ.

*flavipennis* Lec.

## MORDELLIDÆ.

*aspersa*—*Mordellistena*.  
     *comata*—*Mordellistena*.  
*Mordella rufa*—*Anaspis*.  
     *scutellaris* Fabr.



vilis—Mordellistena.  
**Mordellistenus æqualis** Sm.  
 aspersa (Mels.)  
 comata Lec.  
 militaris Sm.  
 pusio Lec.  
 rufa (Say.)  
 infima Lec.

intermixta Helm.  
 nubila Lec.  
 tosta Lec.  
 unicolor Lec.  
 vilis (Lec.)  
**Pentaris hirsuta** Sm.  
 nubila (Lec.)

#### MELANDRYIDÆ.

Beetles of this family feed on fungi.

**Carebara californica** Fall.  
 brevicollis Fall.  
*Dircæa riversii*—**Phlæotrya**.  
**Eustrophus indistinctus**  
 repandus (not California).  
**Hallomenus scapularis** Mots.  
**Holostrophus impressicollis** Lec.  
*Hypulus bicincta*—**Phlæotrya**.  
 riversii—**Phlæotrya**.  
 vandaueri—**Phlæotria**.  
**Lacconotus pinicolus** Horn.

**Marolia fulminans** Lec.  
**Mycterus canescens** Horn.  
 concolor Lec.  
 quadricollis Horn.  
**Nothus luteus** Horn.  
**Phlæotrya bicincta** (Horn.)  
 riversi (Lec.)  
 vandaurei Muls.  
**Phryganiphilus collaris** Lec.  
**Serropalpus barbatus** Schal.  
**Tetratoma concolor** Lec.

#### MONOMMIDÆ.

**Hyporhagus gilensis** Horn.

#### ÆGIALITIDÆ.

**Ægialites californicus** (not California.) fuchsii Horn.

#### STYLOPIDÆ.

The Stylopidae are parasitic upon bees and wasps. The females are larva-form. The group have been separated as a distinct order under the name Strepsiptera.

**Xenos auriferi** Pierce.

### ELATERINA

#### BUPRESTIDÆ.

The Buprestidae have been called the short horned wood borers in contrast with the Cerambycidae. The food habits are as follows:—

**Pine** *Acmaeodera connexa*, *Buprestisadjecta*, *aurulenta*, *læviventris*, *Calcephora*, *Chrysobothris californica*, *contigua*, *dolata*, *Hippomelasgentilis*, *intrusa*.  
**Fir** *Dicerca californica*, *sexualis*. **Cedar** *Chrysobothrisnixa*. **Willow** *Agrilus niveiventris*, *politus*, *Anthaxia deleta*. **Poplar** *Buprestis fasciata*. **Oak** *Agriluspolitus*, *Anthaxia ænogaster*, *Buprestis gibbsii*, *Chrysobothris femoratus*, *Polycesta californica*. **Mesquite** *Acmaeodera gibbula*, *Chrysobothris deleta*, *merkeleii*, *octocola*, *Gyascutus*, *Polycesta velasco*. **Alder** *Dicerca hornii*. **Fruit trees** *Chrysobothris femorata*.

**Acmaeodera acuta** Lec.  
 alacris Horn.

*angelica* Fall.  
*alicia* Fall.

bishopiana Fall.  
bowditchi (not California).

comata Lec.  
connexa Lec.  
coquilletti Fall.  
dohrni Horn.  
dolorosa Fall.  
fenyesi Fall.  
flavomarginaata Gray.  
flavosticta Horn.  
gemina Horn.  
gibbula Lec.  
guttifera Lec.  
hepburnii Lec.  
hæmorrhœa—stellaris.  
immaculata—pulchella.  
jocosa Fall.  
lanata Horn.  
lareæ Fall.  
labyrinthica Fall.  
morbosa Fall.  
mariposa Horn.  
nebulosa—gemina  
opacula (not California).  
plagiaticauda Horn.  
porosa Fall.  
postica Fall.  
pubiventris Horn.  
pulchella Herb.  
quadrivittata Horn.  
quadriseriata Fall.  
robusta Horn.  
stellaris (not California.)

tuta Horn.  
vandykei Fall.  
variegata Lec.  
versuta—guttifera.

Actenodes acornis Say.  
mendax Horn.

Agrilus angelicus Horn.  
blandus Horn.  
gibbicollis Fall.  
illectus Fall.  
jacobinus Horn.  
lacustris Lec.  
niveiventris Horn.  
obolinus Lec.  
politus Say.  
walsinghami Cr.

Ancyllochira aphricans—Buprestis.  
connexa—Buprestis.  
gibbsii—Buprestis.  
læviventris —Buprestis.  
rusticum—Buprestis maculiven-  
tris.

villosa Lec.

Anthaxia æneogaster L. & G.  
ænescens—æneogaster.  
cyanella (not California).  
deleta Lec.  
expansa—æneogaster.  
foveicollis—æneogaster.  
nanula—æneogaster.  
quercata Fabr.  
simuala—æneogaster.  
strigata—æneogaster.

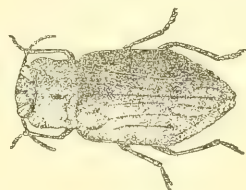


Figure 188. Buprestid beetle and larva.

Buprestis adjecta Lec.  
apricans (not California).  
aurulenta Linn.  
confluens Say.  
connexa Horn.  
fasciata Fabr.  
fulvoguttata—Melanophila.  
gibbsii (Lec.)  
læviventris Lec.  
langii—fasciata.  
lauta—aurulenta.  
longipes—Melanophila.  
maculiventris Say.  
subornata Lec.  
rusticorum—maculiventris.  
Calcophora angusticollis Lec.  
planicosta—Gyascutus.  
Chrysobothris æneola Lec.  
californica Lec.  
caurina Horn.

*carinipennis* Lec.  
*contigua* Lec.  
*cuprascens* Lec.  
*cyarella* Horn.  
*debilis* Lec.  
*deleta* Lec.  
*deserta* Horn.  
*dolata* Horn.  
*errans* Gory.  
*femorata* Fabr.  
*ludificata* Horn.  
*mali* Horn.  
*merkeleii* Horn.  
*monticola* Fall.  
*nixa* Horn.  
*octocola* Lec.  
*prasina* Horn.  
*pubescens* Fall.  
*purpurifrons* Mots.  
*scabripennis* L. & G.  
*semisculpta* Lec.  
*sylvania* Fall.  
*texana* Lec.  
*viridicyanea* (Horn.)  
*vulcanica*—*californica*.  
*Chrysophana placida* Lec.  
*Dicera californica* Cr.

*hornii* Cr.  
*pectorosa* Lec.  
*prolongata* Lec.  
*sexualis* Cr.  
*Dystaxia murrayi* Lec.  
*Clyposcelimorpha marmorata* Horn.  
*Gyascutus californicus*—*Hippomelas*.  
*coelatus*—*Hippomelas*.  
*cuneatus* Horn.  
*obliteratus* Lec.  
*planicosta* (Lec.)  
*Hippomelas californicus* (Horn.)  
*coelatus* Lec.  
*appendiculata* Fabr.  
*conspua* Lec.  
*fulvoguttata* (Har.)  
*gentilis* Lec.  
*guttulata* Gebl.  
*intrusa* Horn.  
*longipes* Say.  
*Polycesta carifornica* Lec.  
*velasco* L. & G.  
*Ptosima walshii* Lec.  
*Schizopus laetus* Lec.  
*sallei* Horn.  
*Taphrocerus gracilis* Say.

## THROSCIDÆ.

*Aulanothruscus validus* (Lec.)  
*Drapetes plagiatus* (Boh.)  
*Lissomus plagiatus*—*Drapetes*.  
*Pactopus hornii* Lec.  
*Throscus mendax* Horn.

*parvulus* Lec.  
*sejunctus* Horn.  
*sericeus* Lec.  
*validus*—*Aulanothruscus*.

## ELATERIDÆ.

The larvæ of the Elateridæ are known as wire worms and the species living in the ground feed on the roots of plants and are very injurious. Many of the members of this family live in rotten wood.



Figure 189. Wire worm, the larva of an Elaterid.

*Adelocera cavicollis*—*profusa*.  
*profusa* Cand.  
*sparsa* Cand.  
*rorulenta* Lec.  
*Agriotes apicalis* Lec.  
*californicus*—*Dolopus*.  
*ferrugineipennis* Lec.  
*fucsus* Lec.

*hispidus* Lec.  
*imperfectus* Lec.  
*inversus* Cand.  
*nevadensis* Lec.  
*opaculus* Lec.  
*protractus*—*Leptoschema*.  
*sparsus* Lec.  
*subustus*—*Dolopus lateralis*.  
*thevenetii* Horn.  
*torquatus* Lec.  
*Alaus melanops* Lec.  
*Anamesus convexicollis*—*Aplastus op-*  
*tatus*.  
*Anchastus bicolor* Lec.  
*cinereipennis* Man.

- desertus Horn.  
 militaris Cand.  
 puberulus—cinereipennis.  
 recedens—cinereipennis.  
 regularis—cinereipennis.  
 tantilus—cinereipennis.  
**Aplastus angusticollis** Horn.  
 corymbitoides Horn.  
 molestus Horn.  
 optatus Lec.  
 serratus Lec.  
 speratus Lec.  
 tenuiformis Horn.  
**Aphricus californicus** Lec.  
**Asaphes carbonatus** Lec.  
 caricinus—carbonatus.  
 dilaticollis Mots.  
 hirtus Cand.  
 morio Lec.  
 tumescens Lec.  
 verna—morio.  
**Athous agriotoides** Fall.  
 aterrimus Fall.  
 axillaris Horn.  
 discors—discrepans.  
 discrepans Reitt.  
 excavatus Mots.  
 falli Reitt.  
 ferruginosus Esch.  
 imitatus Fall.  
 ingens Fall.  
 limbatus Lec.  
 nigripilis Mots.  
 nugalii Fall.  
 opalinus Cand.  
 palpalis Fall.  
 polygenus Fall.  
 quadricollis—falli.  
 recticollis—rectithorax.  
 rectithorax Reitt.  
 scissus Lec.  
 vittiger Lec.  
**Camphylus fulvus** Mots.  
**Cardiophorus abbreviatus** Bland.  
 æneus Horn.  
 amplicollis Mots.  
 bifasciatus Blanch.  
 californicus—Limonius.  
 carbonatus Blanch.  
 coxalis Blanch.  
 crinitus Blanch.  
 dispar Blanch.  
 edwardsii Horn.  
 fenestratus Lec.  
 fulvipes—tenebrosus.  
 gemmifer Blanch.  
 inanus—Horisonotus.  
 latiusculus Esch.  
 longior Lec.  
 luridipes Cand.  
 mimeticus Horn.  
 obscurus Lec.  
 seniculus Blanch.  
 stigmaticus Cand.  
 sufflatus—Horisonotus.  
 tantillus—Anchastus.  
 tenebrosus Lec.  
 transfugus—Horisonotus.  
 tumidicollis Lec.  
**Chalcolepidus rubripennis** Lec.  
 smaragdinus Lec.  
 tarsatus Fall.  
 webbii Lec.  
**Corymbetes æripennis** Kirby.  
 angularis Lec.  
 anthrax Lec.  
 bombycinus—fallax.  
 brewerii Horn.  
 carbo Lec.  
 caricinus Germ.  
 colossus Lec.  
 conjugens Lec.  
 cribrus Lec.  
 cruciatus Linn.  
 diversicolor—rotundicollis.  
 edwardsii—cruciatus.  
 excavatus Lec.  
 exclamationis Fall.  
 fallax Say.  
 fraternus Lec.  
 fertivus Lec.  
 fuscus Lec.  
 inflatus Say.  
 jaculus Lec.  
 leucaspis Germ.  
 linearis Fall.  
 macer Fall.  
 maurus Lec.  
 mirabilis Fall.  
 miserabilis Fall.  
 moerens Lec.  
 monticola Horn.  
 nigricans Fall.  
 nigricollis Bland.  
 nubilus—propola.  
 oblongoguttatus Mots.  
 obscurus Lec.  
 obversus Horn.  
 ochreipennis Lec.  
 opaculus Lec.

- polygenus—Athous.  
 propola Lec.  
 pruinus Horn.  
 rotundicollis Say.  
 rufipennis Fall.  
 rupestris Germ.  
 semiluteus—fallax.  
 semivittatus Say.  
 serraticornis—colossus.  
 teres Lec.  
 tigrinus—triundulatus.  
 triundulatus Rand.  
 umbripennis Lec.  
 xanthomus Horn.  
**Cryptohypnus cinereipennis—Anchas-**  
 tus.  
   gicolor Esch.  
   colon Horn.  
   funebis Cand.  
   gradarius—Hypnoideus.  
   inops—Hypnoideus pectoralis.  
   nocturnus Esch.  
   ornatus—Hypnoideus.  
   pectoralis—Hypnoideus.  
   quadricollis Lec.  
   squalidus Lec.  
   striatulus—Hypnoideus.  
   tantillus—Anchastus.  
**Dicrepidius corvinus Cand.**  
**Dolopius californicus—lateralis.**  
   lateralis Esch.  
   simplex—lateralis.  
   subustus—lateralis.  
**Drasterius comis Lec.**  
   elegans (not California).  
   grandicollis Horn.  
   livens Lec.  
   præses Cand.  
   siminulus Cand.  
**Elater affinis Lec.**  
   apricatus Say.  
   ater Lec.  
   atripennis Horn.  
   behrensi Horn.  
   carbonicolor (not California)  
   cordatus Horn.  
   cordifer Lec.  
   dimidiatus Lec.  
   fastus Lec.  
   hepaticus Mels.  
   horni Cand.  
   ignobilis Boh.  
   longicornis Lec.  
   melinus Lec.  
   moerens Lec.  
   phelpsii Horn.  
   rhodopus Lec.  
   turbulentus—Megapenthes.  
   variegatus Boh.  
**Elatrinus anthrax Horn.**  
**Esthesops dispersus Horn.**  
**Euthesanius lautus Lec.**  
   pretiosus Lec.  
**Horistonotus basalis Horn**  
   definitus Horn.  
   gracilis Horn.  
   inanus (Lec.)  
   simplex Lec.  
   sulcatus (Lec.)  
   transfugus (Lec.)  
**Hypnoides caurinus Horn.**  
   choris Say.  
   cucullatus Horn.  
   funebis—Cryptohypnus.  
   dispersus Horn.  
   dubius Horn.  
   gradarius Horn.  
   nocturnus—Cryptohypnus.  
   ornatus (Lec.)  
   pectoralis (Say.)  
   striatulus (Lec.)  
**Ischiodontus ferreus Lec.**  
**Leptoschema protractum Horn.**  
**Lepturoides fulvus—Campylus.**  
**Limonius angulatus Mots.**  
   californicus (Man.)  
   clypeatus Mots.  
   canus Lec.  
   consimilis Walk.  
   cribricollis Horn.  
   crotchii Horn.  
   discoideus Lec.  
   discollis—maculicollis.  
   fulvipes Fabr.  
   fulvipilis Cand.  
   hispidus—californicus.  
   humeralis—ornatulus.  
   infuscatus—pilosus.  
   maculicollis Mots.  
   mandibularis—discoideus.  
   mirus Lec.  
   nitidulus Horn.  
   occidentalis Cand.  
   ornatulus Lec.  
   pilosus Lec.  
   quadrinaculatus—Megapenthes.  
   subauratus Lec.  
   subcostatus—canus.  
   ulkei—mirus.  
   pilosus Lec.



*vernalis* Fall.  
*Ludius ater* Cand.  
*iecontei* Horn.  
*pinguis* Horn.  
*Megapenthes aterrimus* Horn.  
*elegans* Horn.  
*lepidus* Lec.  
*moereus* Lec.  
*nigriventris* Lec.  
*quadrимaculatus* Horn.  
*rogersi* Horn.  
*stigmaeus* Lec.  
*tartareus* Lec.  
*turbulentus* (Lec.)  
*Melanactes densus* Lec.  
*procerus* (not California).  
*schaumi*—*Plastocerus*.  
*Melanotus cribricollis* Cand.  
*erro* Lec.

*longulus* Lec.  
*oregonensis* Lec.  
*variatus* Lec.  
*Meristhus cristatus* Horn.  
*Monocrepidius comis* Lec.  
*sordidus* (not California).  
*Oxygomus ater* Horn.  
*Perothops cervina* Esch.  
*witticki* Lec.  
*Phlegon ouqueti* (not California).  
*herculeanus* (not California).  
*Pityobius murrayi* Lec.  
*Plastocerus frater*—*schaumii*.  
*megalops* Fall.  
*schaumii* Lec.  
*Serocossomus debilis* Lec.  
*flavipennis*—*debilis*.  
*Tricrepidius triangulicollis*—*Ischiodon-*  
*tus*.

#### EUCNEMIDÆ.

*Anelastes druryi* Kirby.  
*latereillei*—*druryi*.  
*Cryptosoma dohrnii*—*Palæoxenus*.  
*Dromiolus basalis* (Lec.)  
*californicus* Bom.  
*hospitalis* Blanch.  
*nitens* Horn.

*Eucnemis americana* Horn.  
*Eornax pasalis*—*Dromeolus*.  
*Melasis rufipennis* Horn.  
*Palæoxenus dohrnii* (Lec.)  
*Sarpedon scabrosus* Bonv.  
*Xylobius cylindriciformis* Horn.

#### CEROPHYTIDÆ.

*Cerophytum convexicollis* Lec.

### CANTHARINA.

#### CANTHARIDÆ.

This family has been more commonly known under the names *Telephoridæ* and *Lampyridæ*. The latter name applying particularly to the group that emit light and are popularly known as fireflies. All the members of the family are predaceous.

*Calochromus dimidiata* (Lec.)  
*Calopteron reticulatum* (Fabr.)  
*Cenophengus debilis* Lec.  
*Dictyoptera dimidiata*—*Calochromus*.  
*lætus*—*Eros*.  
*Ditemus obtusus* Lec.  
*Ellychia californica* Mots.  
*corrusca* Linn.  
*Eros lætulus* (Mots.)  
*Lamprohiza riversi* Lec.  
*Lampyrus corrusca*—*Ellychia*.  
*Lucidota californica*—*Pyrropyga*.  
*Lycus reticulatus*—*Calopteron*.  
*Malthinus fuscus*—*Malthodes*.

*Malthodes arbustorum* Keis.  
*fragilis* Lec.  
*fuscus* Lec.  
*laticollis* Lec.  
*transversus* Lec.  
*Malthacus latimanus*—*Podabrus*.  
*Mastinocerus opacus*  
*Malthetius theveneti* Lec.  
*Microphotus angustus* Lec.  
*Phengodes integripennis*—*Zarhippus*.  
*Photinus californicus*—*Ellychnia*.  
*reversus* Gem.  
*Podabrus binotatus* Lec.  
*bolteri* Lec.

cavicornis Lec.  
 cinereipennis Mots.  
 comes Lec.  
 corneus Lec.  
 latimanus (Mots.)  
 lutosus Lec.  
 macer Lec.  
 mellifluus—latimanus.  
 mellitus Lec.  
 pruinosis—tomentosus.  
 tejonius Lec.  
 tomentosus Say.  
 xanthoderus Lec.  
 Polemius languidus Horn.  
 Pterotus obscuripennis Lec.  
 Pyropyga fenestralis (Mels.)  
 indicta Lec.  
 Silis cava Lec.  
 filligera Lec.

lutea Lec.  
 pallida Man.  
 Telephorus concors Lec.  
 divisus Lec.  
 fraxini Say.  
 grandicollis Lec.  
 lautus Lec.  
 notatus Man.  
 ochropus Lec.  
 peregrinus—notatus.  
 tibialis—concors.  
 tibiellus Gem.  
 transmarinus Mots.  
 Zarhipis integripennis (Lec.)  
 piciventris Lec.  
 riversi Horn.  
 ruficornis Lec.  
 ater—Trichochrous.

## MALACHIDÆ.

Adasytes laciniatus Cas.  
 Allonyx denudatus Cas.  
 disjunctus Cas.  
 sculptilis (Lec.)  
 Anthocomus basalis—Attalus.  
 cinctellus—Attalus.  
 difficilis—Attalus.  
 lobatus—Attalus lobatulus.  
 submarginatus—attalus.  
 Atelestus abdominalis (Lec.)  
 basalis—Enerdes.  
 collaris—Enerdes.  
 Attalus basalis (Lec.)  
 cinctus (Lec.)  
 difficilis (Lec.)  
 elegans Horn.  
 lobatulus Lec.  
 oregonensis Horn.  
 rostratus Horn.  
 rufomarginatus (Mots.)  
 setosus Horn.  
 submarginatus (Lec.)  
 transmarinus Fall.  
 trimaculatus (Mots.)  
 unicolor Horn.  
 Biturosomus rufipes—Trichochrous  
 griseus.  
 Chariessa dichroa Lec.  
 elegans Horn.  
 Charopus hamifer Kies.  
 longicollis—Microlepus.  
 mœreus—Microlepus Mots.  
 uniformis Mots.  
 Collops argutus Fall.  
 cribratus Lec.

crusoe Fall.  
 histrio Er.  
 insulatus Lec.  
 marginellus Lec.  
 marginicollis Lec.  
 punctulatus Lec.  
 Dasyrhodus impressicollis Fall.  
 longior Fall.  
 Dasytastes bicolor Cas.  
 catalina Cas.  
 dispar Cas.  
 insularis Fall.  
 otiosus Cas.  
 remissus Cas.  
 Dasytellus inconspicuus Cas.  
 Dasytes ænescens—Trichochrous.  
 antennatus—Trichochrous.  
 californicus—Trichochrous.  
 brevicornis—Trichochrous.  
 brevipilosus—Trichochrous.  
 breviusculus Mots.  
 canescens—Listrus.  
 clementæ Fall.  
 conformis—Trichochrous.  
 constrictus—Eschatocrepis.  
 cruralis (Lec.)  
 cylindricus—Trichochrous.  
 difficilis—Listrus.  
 dissimilis Cas.  
 expansus Cas.  
 fastidiosus Cas.  
 fulvitaris—Trichochrous.  
 fuscus—Trichochrous.  
 grandiceps—Trichochrous.  
 griseus—Trichochrous.

- hirtellus*—*Trichochrous*.  
*laticollis*—*Trichochrous*.  
*luteipes*—*Listrus*.  
*macer* Cas.  
*minutus* Cas.  
*motschulskei*—*Listrus*.  
*musculus* Fall.  
*nitens* Cas.  
*parvicollis*—*Trichochrous*.  
*pedalus*—*Trichochrous*.  
*obscurus*—*Listrus*.  
*piceus* Lec.  
*punctipennis*—*Trichochrous*.  
*pusillus* Lec.  
*rotundicollis*—*Listrus*.  
*sculptilis*—*Allonyx*.  
*seminidus* Lec.  
*sordidus*—*Trichochrous*.  
*squalidus*—*Trichochrous*.  
*suturalis*—*Trichochrous*.  
*umbratus*—*Trichochrous*.  
*Ebæus bicolor* *Pseudobæus*.  
*submarginatus*—*Atalus*.  
*Eneodes abdominalis* Lec.  
*basalis* (Lec.)  
*collaris* Lec.  
*Eschatocrepis constrictus* Lec.  
*Eudasytes amplius* Cas.  
*ursinus* Cas.  
*Eurelymus flavipes* Lec.  
*Harpalorhinus biguttulus*—*Malachius*.  
*mirandus*—*Malachius*.  
*Listrus amplipollis* Cas.  
*annulatus* Cas.  
*balteus* Cas.  
*canescens* (Man.)  
*confusus* Cas.  
*constricticollis*—*Eschatocrepis*  
*constrictus*.  
*definitis* Fall.  
*denticollis* Cas.  
*difficilis* (Lec.)  
*extricatus* Cas.  
*famelicus* Cas.  
*fidelis* Cas.  
*incertus* Cas.  
*interruptus* Lec.  
*interstitialis* Cas.  
*luteipes* (Lec.)  
*maculosus* Cas.  
*molannus* Cas.  
*motschulskyi* (Lec.)  
*obscurus* (Lec.)  
*pardalis* Cas.  
*punctatus* Mots.  
*rotundicollis* (Lec.)  
*subæneus* Cas.  
*tibialis* Mots.  
*tritatus* Cas.  
*Malachius acutipennis* Fall.  
*apicalis* Mots.  
*auritus* Lec.  
*bakeri* Fall.  
*biguttatus* Horn.  
*directus* Fall.  
*inornatus* Fall.  
*longiceps*—*Thanaos*.  
*macer* Horn.  
*mirandus* (Lec.)  
*mixtus* Horn.  
*nigrinus* Fall.  
*pristinus* Fall.  
*prolixicornis* Fall.  
*spinipennis* Horn.  
*thevenetii* Horn.  
*ulkei* Horn.  
*unicolor* Mots.  
*viridulus* Fall.  
*Pristoscelis ænescens*—*Trichochrous*.  
*antennatus*—*Trichochrous*.  
*ater*—*Trichochrous*.  
*mœrens* (Lec.)  
*Pseudobæus bicolor* (Lec.)  
*Melyria flavipes*—*Euryelmi*.  
*Microlipus laticeps* Lec.  
*longicollis* (Mots.)  
*brevicornis*—*Trichochrous*.  
*brevipilosus*—*Trichochrous*.  
*brevipilosus*—*Trichochrous*.  
*californicus*—*Trichochrous*.  
*conformis*—*Trichochrous*.  
*cruralis*—*Dasytes*.  
*cylindricus*—*Trichochrous*.  
*fulvotarsis*—*Trichochrous*.  
*fuscus*—*Trichochrous*.  
*grandiceps* Lec.  
*griseus*—*Trichochrous*.  
*hirtellus* *Trichochrous*.  
*laticollis*—*Trichochrous*.  
*oregonensis*—*Trichochrous*.  
*pedalis*—*Trichochrous*.  
*punctipennis*—*Trichochrous*.  
*quadricollis*—*Trichochrous*.  
*rufipes*—*Trichochrous*.  
*sordidus*—*Trichochrous*.  
*suturalis*—*Trichochrous*.  
*tejonius*—*Trichochrous*.  
*umbratus*—*Trichochrous*.  
*Rhadalus testaceus* Lec.  
*Scalopterus trimaculatus*—*Atalus*.

- Thanops abdominalis* Lec.  
*longiceps* Lec.  
*Trichochrous ænescens* (Lec.)  
*agrestus* Cas.  
*antennatus* (Mots.)  
*apicalis* Cas.  
*ater* (Bald.)  
*barbaræ* Cas.  
*brevicollis* Lec.  
*brevicornis* (Lec.)  
*brevipilosus* (Lec.)  
*brevis* Cas.  
*californicus* (Mots.)  
*compactus* Cas.  
*conformis* (Lec.)  
*conspersus* Cas.  
*curticollis* Cas.  
*cuspidatus* Cas.  
*cynildricus* (Mots.)  
*discipulus* Cas.  
*fallax* Cas.  
*femoralis* Cas.  
*fimbriatus* Cas.  
*fraternus* Cas.  
*fulvotarsis* (Bland.) ..  
*fulvescens* Cas.  
*fuscus* (Lec.)  
*griseus* (Lec.)  
*hirtellus* (Lec.)  
*histris* Cas.  
*indigens* Cas.  
*innocens* Cas.  
*insignis* Cas.  
*irrasus* Cas.  
*laticollis* (Man.)  
*lobatus* Cas.  
*mucidos* Cas.  
*nigrinus* Cas.  
*nubilatus* Cas.  
*parvicollis* (Man.)  
*pedalis* Lec.  
*politus* Say.  
*prominens* Cas.  
*propinquus* Cas.  
*pruinosis* Cas.  
*punctipennis* (Lec.)  
*quadricollis* Lec.  
*remotus* Cas.  
*rusticus* Cas.  
*separatus* Cas.  
*sinuosus* Cas.  
*sobrinus* Cas.  
*sordidus* (Lec.)  
*squalidus* (Lec.)  
*stricticollis* Cas.  
*subclavis* Cas.  
*suffusus* Cas.  
*suturalis* (Lec.)  
*tectus* Cas.  
*transversus* Cas.  
*umbratus* (Lec.)  
*vilis* Cas.  
*villosus* Cas.  
*Vectura longiceps* Cas.

## RHIPICERIDÆ.

*Sandalus californicus* Lec.

## DASCYLLIDÆ.

The beetles of this family are predaceous on other insects.

- Alloponogon villosus* Horn.  
*Anchyteis velutina* Horn.  
*Anorus piceus* Lec.  
*Cantheris variabilis*—Cyphon.  
*Dascyllus davidsonii* Lec.  
*lumbus* Horn.  
*Euryponogon californicus* Horn.  
*Euscaphurus salteror* Cas.  
*confusus* Mels.  
*Macropogon testaceipennis* Mots.  
*Placonycha edwardsii* (Lec.)  
*Stenocolus scutellaris* Lec.

## HELODIDÆ.

- Acneus quadrimaculatus* Horn.  
*Cyphon brevicollis* Lec.  
*concinus* (Lec.)  
*exiguus* Horn.  
*variabilis* (Thunt.)  
*Dichranopselaphus edwardsii*—Placonycha  
*Eucinetus infumatus* Lec.  
*Helodes apicalis* Lec.  
*brevicollis*—Cyphon.  
*concinus*—Cyphon.  
*Scirtes californicus* Wots.

# CLERINA.

## CISIDÆ.

*Cis dichroa* Lec.  
vitula—*Ennearthron*.

*Ennearthron californicum* Cas.  
vitulus Man.

## CLERIDÆ.

The beetles of this family are predaceous on other insects.

*Aulicus nero* Spin.  
*Chartessa dichroa* Lec.  
elegans Horn.  
*Chlerus abruptus* Lec.  
carbonarius Spin.  
cinctipennis Spin.  
eximius Man.  
interceptus Spin.  
mœstus Kl.  
nigroventris Lec.  
quadrisignatus Say.  
repandus—*Thanasimus*.  
rufipennis Spin.  
signaticollis Spin.  
sphegeus Fabr.  
*Corgnates marginellus* Chev.  
ruficollis Fabr.  
*Cregya fasciata* Lec.  
*Cymatodera angustata* Spin.  
balteata—undulata.  
californica Horn.  
cylindricollis Chev.  
fuscula Lec.  
moresa Lec.  
ovipennis Lec.  
pilosella—ovipennis.

punctata Lec.  
puncticollis Bland.  
undulata (Say.)  
usta—cylindricollis.  
*Elasmocerus californicus* Fall.  
*Enopium dichroum*—*Chartessa*.  
*Hydnocera bicolor* Lec.  
discoidea Lec.  
robusta Horn.  
scabra Lec.  
*Lebasciella maculicollis* Lec.  
marginella—*Corgnates*.  
*Necrobia ruficollis*—*Corgnates*.  
*Perilyptus carbonarius* Spin.  
*Tillus undulata*—*Cymatodera*.  
*Trichodes bimaculatus* Lec.  
ornatus Say.  
tenellus—ornatus.  
*Trogodendron edwardsii* Horn.  
*Thanasimus dubius* Fabr.  
duglasianus White.  
eximius—*Clerus*.  
nigriventris—*Clerus*.  
repandus Horn.  
rubriventris Lec.

## PTINIDÆ.

The beetles of this family are predaceous on other insects.

*Gibbium psylloides* Cze.  
*Mezium americanum* Lap.  
*Trigonogenius fœctus*—globulum.  
globulum Sol.  
*Niptus ventriculus* Lec.  
*Ptinus aganatus* Fall.  
alternatus Fall.  
californicus Pic.  
cælebs Fall.  
cognatus Fall.

eximius Fall.  
fallax Fall.  
fur Linn.  
guadelphei Pic.  
interruptus Lec.  
quadrimaculatus (not Calif.)  
vergrandis Fall.  
verticali Lec.  
*Hedobia angulata* Fall.  
granosa Lec.

## ANOBIIDÆ.

The beetles of this family are predaceous on other insects.

*Actenobius macer* Cas.

pleuralis Cas.



- saginatus Cas.  
 Anobiopsis sericans Fall.  
 Anobium quadrulum Lec.  
 Catorama conjunctum Fall.  
   exiguum Fall.  
   gemiatum Fall.  
   gibbulum Fall.  
   latum Horn.  
   luteotectum Fall.  
   mancum Fall.  
   nubilum Fall.  
   obsoleta—latum.  
   palliatum Fall.  
   pusillum Lec.  
   vestitum Fall.  
 Cœlostethus quadrulus Lec.  
   truncatus Fall.  
 Cœnocara californica Lec.  
   occidens—californica.  
 Calposternus tenuilineatus Horn.  
 Dinapate wrightii Horn.  
 Dorcatoma intiger Fall.  
   pusillus—Catorama.  
 Ernobius alutaceus Lec.  
   callaris Fall.  
   convergens Fall.  
   crotchil Fall.  
   debilis—punctulatus.  
   marginicollis Lec.  
   montanus Fall.  
   nigrans Fall.  
   pallitarsis Fall.  
   punctulatus Lec.  
   socialis Fall.  
   trapecoideus Fall.  
 Euceratocerus macer—Actenobius.  
   pleuralis—Actenobius.  
   saginatus—Actenobius.  
 Eupactus pudicus (undetermined)  
 Eutylistus ulkei Fall.  
 Euvrilletta xyletinoides Fall.  
 Exopioides incisa—Polycaon confertus  
 Ga tralls marginipennis Lec.  
 Hemiptychus intiger—Dorcatoma.  
   latus—Catorama.  
   luteotectus—Catorama.  
   palliaus—Catorama.  
   pusillus—Catorama.  
 Lasioderma serricorne Fabr.  
   opaculus Lec.  
   parvulus—opaculus.  
   planicollis Lec.  
   striatus Mels.  
 Megorama frontalis Lec.  
   ingens Fall.  
 Hadrobregmus gibbicollis Lec.  
   laticolli Fall.  
   viduum Fall.  
 Oligomerodes catalinæ Fall.  
   occidentalis Fall.  
 Oligomerus californicus Fall.  
 Ozognathus cornutus Lec.  
 Paralobium mundum Fall.  
 Petalium bistriatum (not California).  
   californicum Fall.  
 Pitnus pygmæus Gor.  
 Pnitodes setifer Lec.  
 Ptilinus acuminatus Cas.  
 Sitodrepa panicea Linn.  
 Sphæricus gibboides Boie.  
 Theca profunda Lec.  
   striatopunctata—Calopsternus.  
 Trichodesma beyeri Fall.  
   cristata Cas.  
 Trypopytus punctatu Lec.  
 Vrilletta blaisdelli Fall.  
   convexa Lec.  
   expansa Lec.  
   murrayi Lec.  
   plumbea Fall.  
 Xestobium affine Lec.:  
 Xeranobium desertum Fall.  
   macrum Fall.  
 Xyletinus distans Fall.  
   fucatus Lec.  
   lugubris (not California).  
 Xyletomerus histricus Fall.  
   puberulum (undetermined).  
 Zarifa insularis Fall.

## BOSTRYCHIDÆ.

- Amphicerus fortis Lec.  
   punctipennis Lec.  
   teres Horn.  
 Bostrychus californicus Horn.  
 Dinoderus truncatus Horn.  
 Sinoxylon declive Lec.  
   sericans Lec.  
   sextuberculatum Lec.  
   suurale Horn.

## PSOIDÆ.

- Acrepis quadrisignata—Psoa.  
 Polycaon confertus Lec.

punctatus Lec.  
stoutii Lec.  
Posa maculata Lec.

quadrisignata Horn.  
basalis Lec.  
ramicornis Cas.

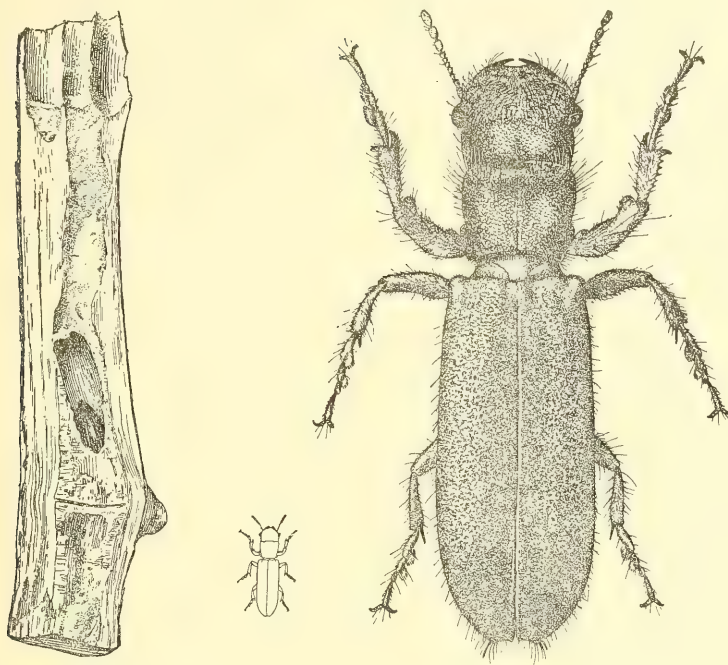


Figure 190. Polycaon confertus, and a grape twig showing work of larva.

LYCTIDÆ.

Tragoxylon californicum Cr.

SPHINDIDÆ.

Odontosphindus clavicornis Fall.

HYDROPHYLINA

HYDROPHILIDÆ.

Berosus californicus Mots.  
exilis Lec.  
infuscatus Lec.  
miles Lec.  
punctatissimus Lec.

rugulosus Horn.  
salinus Fall.  
subsignatus Lec.  
Brachypalpus infuscatus—Creniphilus.  
Cercyon capillatus Lec.

- depressus Steph.  
 fimbriatus Man.  
 fulvipennis Man.  
 lateralis Marsh.  
 lugubris Payk.  
 luniger Man.  
 navicularis Zim.  
 nigriceps Marsh.  
 quisquilius Linn.  
 tristis Ill.
- Chætarthria* minor  
 nigrella Lec.  
 pallida Lec.
- Creniphilus* dissimilis (Horn).  
 infuscatus Mots.  
 rufiventris (Horn.)  
 subcupreus (Say.)
- Cyclonotum* cacti—*Dactylosternum*.  
*Cymbiodyta* dorsalis (Mots.)  
 imbellis (Lec.)  
 punctatostriata (Horn.)
- Dactylosternum* cacti Lec.  
*Helochares* normatus (Lec.)  
*Helophorus* alternatus—*angustulatus*.  
 angustulus Man.  
 fortis Lec.  
 obscurus Lec.  
 pallens Cas.
- Hydræna* pennsylvanica Kines.
- Hydrobius* castaneus—*infuscatus*.  
 cuspidatus—*Phylhydrus*.  
 dissimilis—*Creniphilus*.  
 dorsalis—*Cymbiodyta*.  
 fuscipes Linn.  
 infuscatus (Mots.)  
 latus Horn.  
 nebulosus—*Phylhydrus*.  
 scabrosus Horn.  
 rufiventris—*Creniphilus*.
- Hydrocharis* glaucus Lec.  
 lineatus—*Ochthebius*.  
 obtusatus Say.
- Megasternum* posticatum Man.  
*Phylhydrus* californicus Horn.  
*Limnebius* piceus Horn.  
*Limnocharis* piceus—*Limnebius*  
*Hydrochus* vagus Lec.  
 variolatus Lec.
- Hydrophilus* californicus—*Tropisternus*.  
 dorsalis Brul.  
 ellipticus—*Tropisternus*.  
 limbalis—*Tropisternus*.  
 subcupreus—*Creniphilus*.  
 triangularis Lec.
- Laccobius* ellipticus Lec.  
 carinatus Lec.  
 cristatus—*nebulosus*.  
 cuspidatus (Lec.)  
 diffusus Lec.  
 fuscus—*perplexus*.  
 hamiltoni Horn.  
 imbellis—*Cymbiodyta*.  
 latiusculus—*californicus*.  
 latiusculus—*nebulosus*.  
 nebulosus Say.  
 normatus—*Helochares*.  
 pectoralis—*nebulosus*.  
 perplexus Lec.  
 punctatostriata—*Cymbiodyta*.
- Ochthebius* costipennis.  
 cribricollis Lec.  
 discretus Lec.  
 fossatus—*nitidus*.  
 holmbergi Man.  
 interruptus Lec.  
 lævipennis Lec.  
 lineatus (Lec.)  
 nitidus Lec.  
 puncticollis Lec.  
 vectus Lec.  
 sculptus Lec.
- Tropisternus* apicalpus Chev.  
 californicus Lec.  
 limbalis (Lec.)

## SCARABÆINA

### SCARABÆIDÆ.

This family includes the dung beetles and a series of plant feeding forms known as May beetles, June beetles, Cock chafers, Rise beetles, etc. The larvæ are called white grubs.

- Ægialia* blanchardi Horn.  
*Cœlatus*—*Psammodius*.  
 conferta Horn.  
 crassa Lec.
- Amechanus* serratus—*Bradycinetus*.  
*Amphicoma* canina (Horn.)  
 cooperi—*canina*.  
 edwardsii Horn.

- rathvoni (Lec.)  
 ursina (Lec.)  
*Anomæa centralis* Lec.  
*Aphodius abditus*—*Atænius*.  
   *aleutus* Esch.  
   *alternatus* (Horn).  
   *blaisdeli*—*sparsus*.  
   *cadaverinus* (undetermined)  
   *cogregatus* Man.  
   *consociatus* Horn.  
   *conspersus* Horn.  
   *coquilletti* Lin.  
   *cribratus* Lec.  
   *gentilis* Horn.  
   *granarius* Linn.  
   *hamatus* Say.  
   *inutilis* Horn.  
   *lividus* Oliv.  
   *luxatus* Horn.  
   *militaris* Lec.  
   *neotomæ* Fall.  
   *nevadensis* Horn.  
   *ochreipennis* Horn.  
   *opacus* Lec.  
   *ovipennis* Horn.  
   *pardallis* Lec.  
   *rubidus* Lec.  
   *rugifrons* Horn.  
   *sparsus* Lec.  
   *steracorator*—*Atænius*.  
   *subæneus* Lec.  
   *unguiculus* Fall.  
   *vittatus* Say.  
*Atænius abditus* (Hald.)  
   *californicus* Horn.  
   *desertus* Horn.  
   *gracilis* Mels.  
   *lobatus* Horn.  
   *oblongus* orn.  
   *steracora* or (Fabr.)  
*Bolbocerus hornii* (Riv.)  
   *serratus*—*Bradycinetus*.  
*Bradycinetus hornii*—*Bolbocerus*.  
*Camptorhina seratina* Lec.  
*Canthon corvinus*—*simplex*.  
   *humeralis*—*simplex*.  
   *lævis* (not California).  
   *militaris*—*simplex*.  
   *perplexus* Lec.  
   *puncticollis* (Lower California).  
   *simplex* Lec.  
*Chalepus obsoletus* Lec.  
   *cylindrica* (Esch.)  
   *lacustris* Lec.  
   *latispina* Lec.  
   *rotundata* (Lec.)  
   *socialis* Horn.  
*Copris mœchus* Lec.  
*Cotalpa granicollis* Hald.  
   *ursina* Horn.  
*Cœnonycha elementina* Cas.  
   *parvuula* Fall.  
   *rufescens* Horn.  
*Cremastochilus angularis* Lec.  
   *crinitus* Lec.  
   *depressus* Horn.  
   *ineptus* Horn.  
   *pilosicollis* Horn.  
   *planatus* Lec.  
   *quadrauus* Fall.  
   *schaumii* Lec.  
   *westwoodi* Horn.  
   *wneeleri* Lec.  
*Cyclocephala dimidiata* Burm.  
   *hirta* Lec.  
   *immaculata* Burm.  
   *longula* Lec.  
   *villosa* Burm.  
*Dasydera cooperi*—*Amphicoma ursina*.  
   *rathvoni*—*Amphicoma*.  
   *ursina*—*Amphocoma*.  
*Dichelonycha clypeata* Horn.  
   *crotchii* Horn.  
   *decolorata* Fall.  
   *fulgida* Lec.  
   *fuscula* Lec.  
   *lateralis* Fall.  
   *longiclava* Fall.  
   *muscula* Fall.  
   *nana* Fall.  
   *pallens* Lec.  
   *pectoralis* Lec.  
   *pusilla* Lec.  
   *rotundata*—*Cœlonycha*.  
   *truncata* Lec.  
   *valida* Lec.  
   *vicina* Fall.  
*Diplofaxis angularis* Lec.  
   *brevicollis* Lec.  
   *californica*—*subangulata*.  
   *corvina* Lec.  
   *fimbriata* Fall.  
   *levicoxa* Fall.  
   *mœ ens* Lec.  
   *pacata* Lec.  
   *sierræ* Lec.  
   *subangulata* Lec.  
   *tenebrosa* Fall.  
   *tenius* Lec.  
*Dynacoma marginata* Cas.

- Euphoria californica* (not California.)  
     *verticollis* Horn.  
*Euryomia californica* (not California).  
     *fasciatus* (not California).  
*Geotrupes occidentalis* Horn.  
*Gymnopyge hopliæformis* Lin.  
     *hopliæformis* Lin.  
*Hoplia callipyge* Lec.  
     *convexula*—*pubicollis*.  
     *dispar* Lec.  
     *irrorata*—*pubicollis* Lec.  
     *pubicollis* Lec.  
     *sackeni* Lec.  
*Lachnosterna dubia* Smith.  
     *errans* Lec.  
     *fusca* (Fro.)  
     *lenis* Horn.  
     *mucoreus*—*Listrochelus*.  
*Lichanthæ canina*—*Amphicoma*.  
     *edwardsii*—*Amphicoma*.  
*Ligyrrus californicus*—*gibbosus*.  
     *gibbosus* DeG.  
*Listrochelus mucoreus* (Lec.)  
*Megasoma thersites* (Lower Calif.) ..  
*Melolontha* 10-lineata—*Polyphilla*.  
*Ochodæus californicus* Horn.  
     *estriatus* Sch.  
     *gnatho* Fall.  
*Odontæus obesus* Lec.  
*Oncerus floralis* Lec.  
*Orsonyx anxius* Lec.  
*Oxyomus alternans*—*Atænius*.  
     *cadaverinus*—*Aphodius*.  
     *gracilis*—*Atænius*.  
*Pachyplectrus lævis* Lec.  
*Phæochrous behrensi* (not Calif.)  
*Plectrodes blaisdelli* Cas.  
*Phileurus illatus* Lec.  
*Phobetus comatus* Lec.  
     *centralis*—*comatus*.  
*Pleocoma australis* Fall.  
     *adjuvans*—staff.  
     *behrensi* Lec.  
     *conjugens* Horn.  
     *edwardsii*—staff.  
     *fimbriata* Lec.  
     *hirticollis* Sch.  
     *hoppingi* Fall.  
     *puncticollis* Riv.  
     *rickseckeri* Horn.  
     staff Sch.  
     *ulkei* (not California.)  
*Plectrodes blaisdelli* Cas.  
     *carpenteri* Lec.  
     *fieldi* Fall.  
     *fossiger* Cas.  
     *palpalis* Horn.  
     *pistoria* Cas.  
     *pubescens* Horn.  
     *riversi* Cas.  
     *squamosa* Cas.  
*Pleurophorus cæsus* Panz.  
*Plusiotus gloriosa* (not California.)  
*Polyphilla cavifrons* Lec.  
     *crinita* Lec.  
     *decemlineata* (Say).  
*Psammodius cœlatus* (Lec.)  
     *cylindrica*—*Ægialia*.  
     *nanus* (DeG.)  
*Rhyssemus californicus* Horn.  
*Scarabæus lævis*—*Canthon*.  
     *nanus*—*Psammodius*.  
*Serica alternata* Lec.  
     *anthracina* Lec.  
     *elongatula* Horn.  
     *fimbriata* Lec.  
     *lateralis* Csch.  
     *mixta* Lec.  
     *robusta* Lec.  
     *sericatus* Mots.  
     *serotina* Lec.  
     *silaceus* Say.  
     *simplex* Mots.  
     *valida* Har.  
*Thyce blaisdelli*—*Plectrodes*.  
     *fossiger*—*Plectrodes*.  
     *hartfordi*—*Plectrodes*.  
     *marginata*—*Dinacoma*.  
     *palpalis*—*Plectrodes*.  
     *pistoria*—*Plectrodes*.  
     *pulverea*—*Plectrodes*.  
     *riversi*—*Plectrodes*.  
     *squamosa*—*Plectrodes*.  
*Trox atrox* Lec.  
     *fascifer* Lec.  
     *gemmulatus* Horn.  
     *punctatus* Germ.  
     *suberosus* Fabr.  
*Tryssus comatus*—*Phobetus*.  
*Valgus californicus* Horn.

## LECANIDÆ.

The Stag beetles with antler-like jaws belong to this family. The California species are less conspicuous. Their food habits are as follows:—



**Fir** *Ceruchus*, *Diphyllostoma*. **Redwood** *Diphyllostoma*. **Oak** *Platycerus*.  
*agassii*, *californicus latus* and *opacus*. **Poplar** *Platycerus depressus*. **Alder**  
*Sinodesdron*, *Platycerus oregonensis*.

*Ceruchus punctatus* Lec.  
*striatus* Say.

*Diphyllostoma fibriata* Fall.  
*striatus* Lec.

*Platycerus agassii*. Lec.  
*californicus* Cas.  
*chalybæus—oregonensis*.  
*cærulescens—oregonensis*.

*depressus* Lec.  
*latus* Fall.  
*opacus* Fall.  
*pacificus—agassii* Lec.  
*parvicollis—agassii*.  
*thoracicus* Cas.

*Phyllostoma fimbriata* Fall.  
*Sinodendron rugosum* Man.

## CURCULIONINA

The members of this superfamily are known as weevils.. They all feed on plants and many of them are injurious.

### ANTHRIBIDÆ.

*Anthribus albinus* Linn.  
*Brachytarsus alternatus* Say.  
*scabrosus* Fabr.

*Gonops fissungnis* Lec.  
*Toxotropis approximatus* Lec.

### IPIDÆ.

The members of this family are the wood borers that make the "pin holes" in the bark of trees and the centipede-like burrows under the bark. They are sometimes very injurious. They have the following food habits:—

**Pine** *Dendroctonus brevicornis*, *jeffreyi*, *monticolæ*, *volens*, *Pityophthorus nitidus*. **Fir** *Dendroctonus pseudotsugæ*. **Spruce** *Scolytos unispinosus*. **Cedar** *Phlæosinus cristatus*. **Cypress** *Phlæosinus cupressi*. **Redwood** *Phlæosinus sequoiæ*. **Oak** *Pityophthorus pubipennis*

*Bostrichus pini—Tomicus*.  
*Carphoborus bifurcus* Esch.  
*simplex* Lec.

*Chætrophlæus hystrix* Lec.  
*Corthylus cavus—Cryphalus*.  
*dentiger—Monarthrum*.  
*scutellaris—Monarthrum*.

*Cryphalus atratulus* Lec.  
*carinulatus—Pityophthorus*.  
*cavus* Lec.  
*dentiger—Monarthrum*.  
*digestus—Pityophthorus*.  
*pilosulus—Pityophthorus*.  
*pubipennis—Pityophthorus*.  
*puncticollis—Pityophthorus*.  
*retusus—Pityophthorus*.  
*striatus—Hypothenemus*.  
*sulcatus* Lec.  
*terminalis* Man.

*Dendroctonus barberi* Hop.  
*brevicornis* Lec.

*brevicornis—barberi*.  
*convexifrons* Hop.  
*frontalis—barberi*.  
*frontalis—brevicornis*.  
*jeffreyi* Hop.  
*monticolæ* Hop.  
*pseudotsugæ* Hop.  
*similis—monticolæ*.  
*simplex—pseudotsugæ*.  
*terebrens—valiens*.  
*valiens* Lec.

*Gnathotrichus retusus* (Lec.)

*Hylastes gracilins* Lec.  
*macer* Lec.  
*nigrinus* (Man.)  
*porosus* Lec.  
*rugipennis—Hylurgops*.  
*subcostulatus—Hylurgops*.

*Hylesinus aspericollis* Lec.  
*crenatus—sericeus*.  
*cristatus—Phlæosinus*.

- hystrix—*Chætophlocus*.  
 imperialis Lec.  
 nebulosus Lec.  
 sericeus Man.  
*Hylurgops granulatus* Lec.  
   *rugipennis* (Man.)  
   *subcostulatus* (Man.)  
*Hylurgus nigrinus*—*Hylastes*.  
*Hypothenemus striatus* (Lec.)  
*Ips cacographus* (Germ.)  
   *confusus* Lec.  
   *latidens* Leec.  
   *pini* Say.  
   *plastographus* Lec.  
   *pubipennis* Lec.  
   *sexdentatus* Esch.  
*Micracis hirtella* Lec.  
*Monarthrum dentigerum* (Lec.)  
   *huttoni* Woll.  
   *scutellare* (Lec.)  
*Phlæosinus cristatus* (Lec.)  
   *cupressi* Hop.  
   *sequoiæ* Hop.  
*Pityophthorus carinulatus* (Lec.)
- confinus Lec.  
 cribripennis Esch.  
 digestus (Lec.)  
 nitidulus Man.  
 pilosus Lec.  
 pubipennis Lec.  
 puncticollis (Lec.)  
 retusus Lec.  
 striatus Lec.  
 sulcatus Lec.  
*Scolytus californicus* Lec.  
   *destructor*—*unispinosus*.  
   *præceps* Lec.  
   *subscaber* Lec.  
   *terebrans*—*Chætophlæus* Hys-  
     *trix*.  
   *unispinosus* Lec.  
   *ventralis* Lec.  
*Tomicus cacographus*—*Ips*.  
*Xyleborus cælatu* Esch.  
*Xyloterus bivittatus* Kirby.  
   *hamatus*—*Pityophthorus carinu-*  
     *latu* .  
   *vittiger* Esch.

## CALANDRIDÆ.

The following food habits are known:—

- Pine *Cossonus pisiphilus*, *crenotus*, *Rhyncolus oregonensis*. Buckeye *Rhyn-*  
*olus angularis*. Yucca *Macrorhynchus*, *Scyphophorus*, *Yuccaborus*. Cactus  
*Cactophagus*. Lupine *Rhyncolus pallens*. Poplar and Maple *Cossonus sub-*  
*arcuatus*. Drift wood *Flassoptes*.
- Cactophagus validus* Lec.  
*Calandra granaria* Linn.  
   *oryzæ* Linn.  
*Cossonus californicus*—*piniphilus*  
   *crenatus* Horn.  
   *piniphilus* Sch.  
   *subareatus* Boh.  
*Dryophthorus bitubercuatus* Fabr.  
   *corticalis* (not California).  
*Flassoptes marinus* Horn.  
*Lymnantes scrobicollis* Gyll.  
*Macrorhynchus protractus* Horn.  
*Mesitus tardii* Wall.  
*Metamaseus sericeus* Horn.  
*Metopotoma repens*  
*Phlæophagus minor* Horn.  
*Rhina frontalis*—*Yuccaborus*.  
*Rhyncholus angularis* Lec.  
   *brunneus* Man.  
   *californicus* Wol.  
   *cylindricollis* Wol.  
   *dilatatus* Ca .  
   *dorsalis* Lec.
- oregonensis* Horn.  
   *pallens* Cas.  
   *protensis* Wol.  
   *spretus* Cas.  
*Macrorhynchophorus asperulus* (not Calif.)  
   *palmarum* (not California).  
*Scyphophorus acupunctatus* Gyll.  
   *robustior* (not California).  
   *yuccæ* Horn.  
*Sitophylus oryzæ*—*Calandra*.  
*Sphenophorus abrasus* Chit.  
   *discolor* Man.  
   *gentilis* Lec.  
   *monterensis*—*vomerinus*.  
   *pertinax* Oliv.  
   *pictus* Lec.  
   *procerus*—*Cactophagus validus*.  
   *reticulaticollis* Boh.  
   *robustus* (not California).  
   *simplex* Lec.  
   *subopacus* Chit.  
   *sayi* Gyll.  
   *subcarinatus* Man.

*tardus* Fall.  
*vomerinus* Lec.

*Yuccaborus frontalis* Lec.

CURCULIONIDÆ.

Only a comparative small number of the species of this family of weevils have known food habits.

*Pine* *Magdalis cuneiformis*, *lecontei*, *Pissodes radiatæ*, *yosemite*. *Willow* *Orchestes rufipes*, *salacis*. *Lupine* *Apion proclive*, *Tychius lineellus*.

*Acanthoscellis californicus* Dietz.  
*frontalis* Dietz.  
*perplexus* Dietz.

*Alophu constrictus* Lec.  
*didymus* Lec.

*Apion abdominale* Sm.  
*antennatum* Sm.  
*atripes* (not California.)

*oblitum* (not California).  
*bosoletum* (not California).  
*occidentale* Fall.  
*œdorhynchum* Lec.  
*opacicolle* Sm.  
*ovale*—*obsoletum*.  
*pennsylvanicum* Boh.  
*porosicolle* Gem.

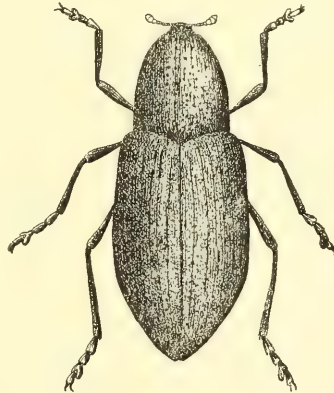
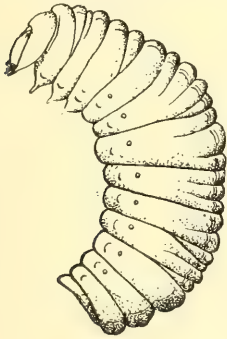


Figure 191 Alfalfa weevil.

*brevicolle*—*cribricolle*.  
*californicum*—*sordidum*.  
*clavinatum* Sm.  
*cavifrons* Lec.  
*chuparosæ* (Lower California).  
*concoloratum*—*carinatum*.  
*confertum* (not California).  
*cordatum* Sm.  
*crassinasum* Lec.  
*cribricolle* Lec.  
*elutipes* (Lower California).  
*floridanum* (not California).  
*fraternum* Sm.  
*funereum* Fall.  
*griseum* (not California).  
*hesperidum* Fall.  
*minor* Sm.

*proclive* Lec.  
*proclive* Lec.  
*protensum* Lec.  
*sordidum* Sm.  
*troglyodytes* Man.  
*turbulentum* Sm.  
*typicum*—*ventricosum*.  
*varicorne* Sm.  
*ventricosum* Lec.  
*vespertinum* Cas.  
*vicinum*—*walshii*.  
*walshii* Sm.  
*Anthonomus æneolus* Dietz.  
*affinis* Lec.  
*albopilosus* Dietz.  
*ater* Lec.

brunneipennis Man.  
 canus Lec.  
 confusus Lec.  
 effetus Dietz.  
 figuratus Dietz.  
 hirtus Lec.  
 inermis Boh.  
 melancholicus Dietz.  
 morulus Lec.  
 ochreopilosus Dietz.  
 ornatus Dietz.  
 pauperculus Lec.  
 peninsularis Dietz.  
 pervilis Dietz.  
 densa—Onychobaris.  
 macra Lec.



Figure 192. Cotton boll weevil.

seriata—Onychobaris.  
 Centrocleonus pilosus Lec.  
 Ceutorhynchus adpersulus Dietz.  
 albopilosus Dietz.  
 angulatus Lec.  
 convexitollis Lec.  
 cyanipennis Germ.  
 decipiens Lec.  
 disturbatus Dietz.  
 equamosus Lec.  
 solani Fall  
 subvittatus Lec.  
 sycophanta Walsh.  
 Alyca ephippiator—Elleschus.  
 Analcis morbillosus—Tyloclerma.  
 Aulobaris naso Lec.  
 Bagous californicus Lec.  
 Balaninus uniformis Lec.  
 Baridius californicus Boh.  
 Barilepton falciger  
 quadricolle Lec.

Barinu difficilis  
 Baris brunneipes  
 densus—Onychobaris.  
 mucoreus—Trichobaris.  
 nasutus—Centrinus.  
 macra—Baris.  
 seriata —Onychobaris.  
 Barytychius discoideus  
 quadricolle Lec.  
 hornii Dietz.  
 isolatu Dietz.  
 mutabilis Dietz.  
 nodipennis Dietz.  
 obliquus Lec.  
 ovipennis Dietz.  
 pollinosus Dietz.



Figure 193. Fuller's rose weevil.

puberulus Lec.  
 pusillus Lec.  
 pusio Man.  
 sericans Lec.  
 subpubescens Lec.  
 testorum Fall.  
 Centrinogyna procera  
 Centrinus confusus Say.  
 lineellus Lec.  
 nasutus Lec.  
 Chelonychus longipes Dietz.  
 Cionistes insolens Dietz.  
 Cleonus erysimi  
 inornatus Lec.  
 molitor Lec.  
 virgatu Lec.  
 vittatus Kirby.  
 Cœlogaster zimmermani Gyll.  
 Conotrachelu duplex  
 dehiscens Fall.  
 koebelei—adpersus.

- littoralis* Fall.  
*longatus* Lec.  
*lunatus* Lec.  
*mamillatus* Lec.  
*mediinotus* Fall.  
*mucidus*—*nubilatus*.  
*princeps* Fall.  
*Copturus adpersus* Lec.  
*Elleschus ephippiatus* Say.  
*Epimechus mobilis* Fall.  
*Emphyastes fucicola* Man.  
*Endalus æratus* Lec.  
     *limatulus* Gyll.  
     *ovalis* Lec.  
*Epimechus æmulus*  
     *adpersus* Dietz.  
     *mimicus* Dietz.  
     *nevadicus* Dietz.  
     *soriculus* Dietz.  
*Euclyptus ferrugineus* Lec.  
*Hypera montivaga* Camp.  
     *serrana* Camp.  
*Lepidosoma californicum* Mots.  
     *dehiscens* Fall.  
     *koebeleri*—*adpersus*.  
     *littoralis* Fall.  
     *mediiventrus* Fall.  
*Cryptohypnus colon* Horn.  
     *funebis* Chaud.  
     *futilis* Lec.  
     *mops* Lec.  
     *ornatus* Lec.  
     *pectoralis* Say.  
     *squalidus* Lec.  
*Cryptorhynchus gracilis* Boh.  
*Desmoris constrictus* Say.  
     *fulvus* Lec.  
     *incertus* Dietz.  
     *sordidus* Lec.  
*Dinocleus albovestitus*  
     *hystrix* Fall.  
*Doryctenus cuneatulus*  
     *hirtus* Lec.  
     *luridus* Man.  
     *mucidus* Say.  
*Leprus perforatus*  
*Limnobaris confusus* Say.  
*Listronotus gracilis* Lec.  
     *teretirostris* Lec.  
*Lixus asperus* Lec.  
     *acutus* Lec.  
     *maritimus* Fall.  
     *modestus* Man.  
     *parvus* Lec.  
     *perforatus* Lec.  
     *perlongus* Fall.  
     *pleuralis* Lec.  
     *poricollis* Man.  
*Macrophoptus estriatus* Lec.  
     *hispidus* Dietz.  
*Macrops californicus* Dietz.  
     *hyperodes* Dietz.  
*Magdalinops vittipennis* Dietz.  
*Magdalus alutacea* Lec.  
     *adenescens* Lec.  
     *convexicollis* Fall.  
     *gentilis* Lec.  
     *gracilis* Lec.  
     *hispoideus* Lec.  
     *hyperodes* Dietz.  
     *imbellis* Lec.  
     *lecontei* Horn.  
     *proxima* Fall.  
     *striata* Fall.  
     *subtincta* Lec.  
     *vitiosa* Fall.  
*Macromastus gracilis* Boh.  
*Onychobaris densa* (Lec.)  
     *seriata* (Lec.)  
*Orchestes albionica* Lec.  
     *ephippiatus* Say.  
     *lapidula* Lec.  
     *mitus* Horn.  
     *parvicollis* Lec.  
     *puberulus* Boh.  
     *ramosa* Gr.  
     *rufipes* Lec.  
     *salicis* Linn.  
*Orthoris crotchii* Lec.  
*Otidocephalus vittatus* Horn.  
*Pachyphanes carus* Dietz.  
*Pachytichius discoideus* Lec.  
     *corpulentus* Lec.  
*Paragages maculatus* Lec.  
*Polencmus cavifrons* Lec.  
*Phycocætes testaceus* Lec.  
*Phyllotrox nubifer* Lec.  
*Piazurus californicus* Lec.  
*Pissodes barbari* Hop.  
     *californicus* Hop.  
     *costatus* Man.  
     *radiatus* Hop.  
     *yosemite* Hop.  
*Plinthus carinatus* Boh.  
*Podapion gallicola* Ril.  
*Promecotarsus maritimus* Gas.  
*Pseudoparis nigrina*  
*Physsematus quibescens*  
*Pycnobaris nigrostriatus* Fall.  
*Rhinonchus longulus* Lec.  
*Sibynes fulvus*  
*Sitones alternans*



californicus Fah.  
 crinitus Oliv.  
 semiculus Man.  
 sordidus Lec.  
 vittatus Lec.  
*Smicronyx californicus* Dietz.  
 cinereus Mots.  
 instabilis Ca.  
 nubilus Dietz.  
 obtectus Lec.  
 ornatipennis Dietz.  
 perplexus Dietz.  
 pusillus Dietz.  
 pusio Lec.  
 resplendens Dietz.  
 scalator Dietz.  
 serriatus Lec.

tardus Dietz.  
*Stenopelmus rufinasus*  
*Synertha imbricata* Ca.  
*Tachyperus quadrigibbosus* Say.  
*Trachotes ptinoides* Germ.  
*Trichobarinus compacta*  
*Trichomagdalis atratus* Fall.  
 conspersus Fall.  
 fasciatus Fall.  
 micorea Lec.  
*Triglyphus ater* Lec.  
*Tychinus lineellus* Lec.  
 semisquamosus Lec.  
 setosus Lec.  
 setosus Lec.  
*Tyloderma morbillosum* Lec.  
*Zascellus irrorata* Lec.

#### OTIORHYNCHIDÆ.

The Otiiorhynchid weevils feed largely on trees. The food of the following are known:—

Pine *Geoderces puncticolis*. *Geodercodes*, *Scythropus albidus*, *californicus*, *elegans*. Fir, *Dyslobus*. Spruce *Scythropus ferrugineus*. Willow *Stamoderes* Oak *Adolares*.

*Adalares humeralis* Cas.  
*adalares humeralis* Cas.  
 ovipennis Cas.  
*Agasphærops nigra* Lec.  
*Agronus cinerarius* Horn.  
 deciduus Horn.  
*Amnesia decidua* Horn.  
 decorata Lec.  
 discors—*sculptilis*.  
 elongate Horn.  
 granulata Cas.  
 rauca Horn.  
 sculptilis Cas.  
 sordida Horn.  
 squamipunctata—*Sculptilis*.  
 tessellata Cas.  
 tumida—*sculptilis*.  
 longipennis Pier.  
 longisternus Cas.  
*Amotus setulosus* Lec.  
*Aragnomus griseus* Horn.  
*Aramigus fulleri* Horn.  
 hispidulus Cas.  
*Dirognathus sordidus* Horn.  
*Dyslobus signis* (Lec.)  
*Dysticheus insignis* Horn.  
 Elissa constricta Cas.  
*Encyllus vagans* Horn.  
*Eupagoderes argentatus* (Lec.)  
 aridus Fall.

desertus Lec.  
 germinatus Lec.  
 mortivallis Fall.  
 plumbeus—*varius*.  
 varius (Lec.)  
*Geoderces incomptus* (Lec.)  
 puncticolis Cas.  
*Geodercodes latipennis* Cas.  
*Miltoderes setosus* Cas.  
 setulosus—*Amotus*.  
*Mimetes seniculus* Horn.  
*Minyomerus languidus* Lec.  
*Mylacus saccatus* Lec.  
*Nocheles vestitus* Cas.  
*Nomidius abruptus* Cas.  
*Ophryastes argentatus*—*Eupagoderes*.  
 varius *Eupagoderes*.  
*Orimodema protracta* Horn.  
*Orthoptochus squamiger* Cas.  
*Otiiorhynchus rugifrons* Gyll.  
 signis—*Dyslobus*.  
*Panormus setosus* Cas.  
*Paraptochus californicus*—*sellatus*.  
*Periteles sellatus*—*Peraptochus*.  
*Peritelopsis globiventris* Lec.  
*Peritelodes obtectus* Cas.  
*Phymatinus gemmatus* Lec.  
*Rhigopsis effracta* Lec.  
 scutellaris—*effracta*.  
*Peritelinus variegatus* Cas.

- Rhyodes dilatatus* Horn.  
*Sciopithes angustalis*—*obscurus*.  
     *brumalis*—*obscurus*.  
     *arcuatus*—*obscurus*.  
     *obscurus* Horn.  
     *setosus* Cas.  
     *significans*—*obscurus*.  
*Scythropus albidus* Fall.  
     *californicus* Horn.  
     *cinereus* Cas.  
     *elegans* Coup.  
     *ferrugineus* Cas.  
     *lateralis* Cas.  
     *miscix* Fall.  
*Stamoderes uniformis* Cas.  
*Stenoptochus inconstans* Cas.  
*Strophosomus alticola*—*Aramigus ful-*  
     *leri*.  
*Thinoxenus squallens* Horn.  
*Thricolepis inornata* Horn.  
*Trogonoscuta pilosa* Mots.  
     *simulator* Horn.

## RHYNCHITIDÆ.

The genus *Deporaus* is found on oak, *Rhynchites aureus* on manzanita and *R. bicolor* feeds on rose and thimble berry.

- Auletes laticollis* Cas.  
     *nasalis* Lec.  
     *rugipennis* Pier.  
     *viridis* Pier.  
*Deporaus glastinus* (Lec.)  
*Rhynchites æratoides* Fall.  
     *aureus* Lec.  
     *bicolor* Fabr.  
     *glastinus*—*Deporaus*.  
     *nasio* Cas.  
     *planifrons* Lec.  
     *velatus* Lec.

## RHINOMACERIDÆ.

The weevils of this family are found on pine flowers

- Diodyrhynchus byturoides* Lec.  
*Rhinomacer bombiformis* Lec.  
     *comptus* Lec.  
     *pilosus* Lec.

## CHRYSOMELINA

## LARIIDÆ.

The snout-like prolongation of the head in this family causes them to be called weevils tho belonging to a different superfamily.

Pea *Laria pisorum*. Bean *Acanthoscelides*. Broad bean *Laria rufimana*. Mesquite *Laria prosopis*.

- Bruchus aureolus* Horn.  
     *aria* Fall.  
     *californicus* Boh.  
     *collosus* Fall.  
     *desertorum* Lec.  
     *discopterus* Fall.  
     *exiguus* Horn.  
     *fraterculus* Horn.  
     *gibbithorax* Sch.  
     *griseolus* Fall.  
     *impiger* Horn.  
     *inquisitus* Fall.  
     *laria* Fall.  
     *limbatus* Horn.  
     *obsoletus* Say.  
     *obtecus*—*obsoletus*.  
     *pauperculus* Lec.  
     *perplexus* Fall.  
     *pisorum* Linn.  
     *pullus* Fall.  
     *prosopis* Lec.  
     *protractus* Horn.  
     *pruinus* Horn.  
     *ramicornis* Boh.  
     *seminulum* Horn.  
     *sordidus* Horn.  
     *texanus* Sch.  
     *uniformis* Lec.  
*Zabrotes densus* Horn.  
     *spectabilis* Horn.

## CHRYSMELIDÆ.

The plant beetles of the family Chrysomelidæ are in some cases general feeders tho in most cases they are associated with a particular plant. The following list includes most of the commoner species:—

**Coniferæ** *Luperoides smaragdinus*. **Pine** *Glyptoscellis illustris*, *pubescens*. **Fir** *Syneta carinata* **Cedar** *Glyptoscellis pubescens*, **Willow** *Crepidodera helxines*, *Diachus*, *Disonycha 5-vittata*, *Galerica flavolimbata*, *Glyptoscellus albidus*, *Pla-*



Figure 194. *Diabrotica soror*.

**umbine** *Cassida bicolor*. **Sidalcea** *Calligrapha sigmoidea*. **Marsh marigold** *Calliodera*, *Syneta albida*, *Zeugophora californica*. **Poplar** *Syneta albida* *Zeugophora*. **Alder** *Haltica bimarginata*. **Buckeye** *Luperodes bivittatus*. **Oak** *Syneta simplex*. **Ceanothus** *Luperodes torquatus*, *varipes* *Odontota californica*, *Orsodachna atra*. **Manzanita** *Colaspidea varicolor*, *Colaspis oregonensis* **Grape** *Adoxus*, *Haltica carinata*. **Raspberry** *Paria canella*. **Cucumber** *Coptocycla bicolor*, *Diabrotica trivittata*. **Solanum** *Cassida pallidula*. **Datura** *Lema*.. *Colligrapha elegans*. **Corn and beets** *Chaetocnema denticulata*. **Milkweed** *Chrysomelus*. **Goldenrod** *Trirhabda flavimarginata*. **Eriogonum** *Saxinus saucia*. **Eriodactylon** *Trirhabda caduca*, *eriodactylonis*. **Grass** *Disonycha pennsylvanica*. **Sedge** *Donacia*.

## SYNOPSIS OF GENERA.

**Haltica:** hind femora enlarged and with transverse impression on base of

prethorax not limited on the side by a longitudinal plica.

**Chætocnemis:** Hind femora enlarged and hind tibiæ toothed on outer margin. **Euplectroscelis:** size large, 5.5 mm.

**Phyllotreta:** hind femora enlarged. **Crepitodera** and **Systema:** front coxal cavities closed, the last with elytra not striate. **Psilloides:** antennæ ten-



Figure 195. Work of *Diabrotica soror*.

jointed. **Ædionychis:** last joint of hind foot globose. **Diabolia:** apical spur of hind tibiæ large. **Glyptina:** elytra striato-punctate. **Longitarsis:** first joint of hind tarsi half as long as tibiæ. **Apthona:** groove on hind tibiæ bifurcate.

**Pachybrachus:** middle ventral segments narrowed. **Exema:** antennæ received in marginal grooves. **Euryscopa**, **Coscinoptera**, **Babia** and **Saxinis:** front coxal cavities confluent, the first two with claws simple, the elytra of the

first with rows of punctures, and the epipleuræ of the last narrow. **Diacus**: claws simple. **Cryptocephalus**: prothorax margined.

**Trirhabda**: antennæ on front between the eyes and claws simple, cleft or acutely toothed. **Diabrotica**: front carinate. **Galeruca** and **Monoxia**: epipleuræ extending to sutural angle, the last with front narrow.

**Luperodes**: antennæ on front between the eyes. **Phyllobrotica**: elytra without epipleuræ. **Androlyperus**: last joint of maxillary palpi not conical. **Scelolyperus**: epipleuræ narrow.

**Crioceris**: prothorax not margined. **Xanthonia** and **Adoxus**: front coxæ distinctly separated, the first with prosternal sutures obsolete. **Donacia**:



Figure 196. Work of *Adoxus obscurus*.

first ventral segment very long. **Zeugophora**: eyes emarginate. **Syneta**: prothorax toothed at the sides. **Tricolema**: prothorax subangulate at sides. **Crasedachna**: prothorax somewhat bell-shaped. **Lema**: prothorax constricted at middle.

**Glyptoscelis**: front not inflexed. **Metachroma**, **Colaspidia** and **Colaspis**: anterior margin of prothorax straight beneath, the last without supraorbital lines on head, the first with body glabrous. **Paria** and **Chrysochus**: body glabrous, the first with hind tibiæ toothed towards the tip. **Myochrous**: sides of prothorax toothed.

**Cassida**. **Microrhopala**, **Odontata** and **Stenopodius**: head free, the last with third joint of tarsi narrow, the first with antennæ apparently nine-jointed. **Coptocycla**: antennæ extending beyond base of prothorax.



*Adoxus obscurus* Linn.  
 vitis—*obscurus*.  
*Androlyperus fulvus* Cr.  
 maculatus Lec.  
*Aphthoma subglobosa* Mots.  
*Aulacoscelis purpurea*  
*Babia quadriguttata* Oliv.  
 tetraspilota Lec.  
*Balophila cerina*—*Glyptina*.  
*Calligrapha californica*—*elegans*.  
 elegans Oliv.  
 serpentina Rog.

rugulosa—*Exema conspersa*.  
*Chrysochus californicus*—*cobaltinus*.  
 cobaltinus Lec.  
 tenebricosus—*cobaltinus*.  
*Chrysomela cæsia*—*Gastroidea cyan-*  
 ea.  
 californica—*Lina*.  
*Colaspis cuprascens* (Lec.)  
 smaragdula (Lec.)  
 subvittata (undetermined).  
 varicolor (Cr.)  
*Colaspis californica* Boh.



Figure 197. Larva of *Adoxus obscurus*.

*Cassida aurisplendens* Man.  
 9-maculata Man.  
 nigripes Oliv.  
 pallidula Boh.  
 texana—*pallidula*.  
*Chaetocnema confinis* Cr.  
 cribrata Lec.  
 cribrifrons Lec.  
 denticulata Ill.  
 ectypa Horn.  
 irregularis Lec.  
 opacula Lec.  
 sigmoidea Lec.  
*Chlamys conspersa*—*Exema*.

cupulenta Horn  
 subcylindrica Lec.  
 subviridis Lec.  
 oregonensis Cr.  
*Coptocycla aurichalcea*—*bicolor*.  
 bicolor Boh.  
 cucumeris—*Epitrix*.  
 helxines Linn.  
 pallida Fall.  
 puberula Boh.  
 sulphurella Boh.  
 subcarinata—*Epitrix*.  
 bicolor Fabr.  
*Coscinoptera œneipennis* Lec.

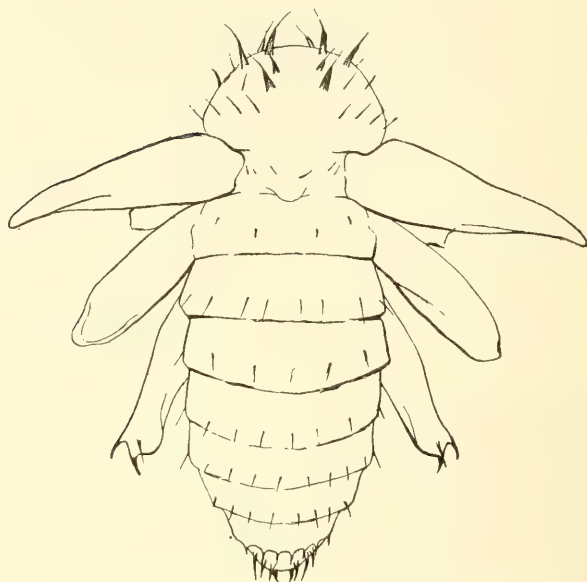


Figure 198 Pupa of *Adoxus obscurus*. (upper side).

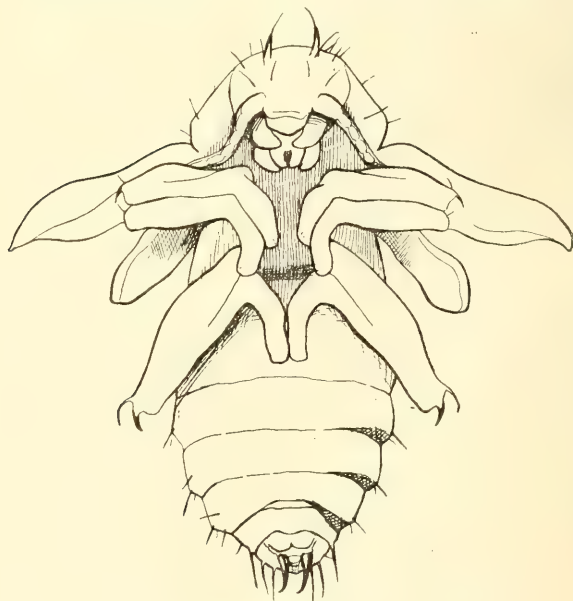


Figure 199. Pupa of *Adoxus obscurus* (lower side).

biferia—canella.  
 canella Lec.  
 mucorea Lec.  
 Crepidodera basalis Cr.  
 vafra Boh.  
 Crioceris asparagi Linn.  
 castaneus Lec.  
 chalconotus Man.  
 limbifer Sid.  
 nigerrimus San.  
 sanguinicollis—lus trans.  
 spurcatus Lec.  
 Cryptocephalus auratus Lec.  
 Diabolia ærea Mels.

pennsylvanica Ill.  
 puncticollis—Monoxia.  
 5-vittata Say.  
 Donacia atra—Orosdachna.  
 californica Lec.  
 cincticornis Newm.  
 emarginata Kirby.  
 hirticollis Kirby.  
 piscatrix Lec.  
 proxima—cincticornis.  
 Epitrix bicolor  
 pusilla Say.  
 subtilis Kun.  
 cucumeris Horn.



Figure 200 Eggs of *Adoxus obscurus*.

borealis Chev.  
 ovata Lec.  
 Diachus auratus Fabr.  
 erasus Lec.  
 Diabrotica 12-punctata Fabr.  
 soror Lec.  
 tenella—12-punctata.  
 trivitta Man.  
 viridipennis Lec.  
 vittata (not Californica).  
 Disonycha alternata Ill.  
 limbicollis—pennsylvanica.  
 maritima Man.

parvula Fabr.  
 subcrinita Lec.  
 Eumolpus cuprascens—Colaspidea  
 smaragdulus—Colaspidea.  
 Euplectrocelis xanti Cr.  
 Euryscopa lecontei Cr.  
 scapularis—lecontei.  
 subtilis Horn.  
 vittata Lec.  
 Exema conspersa Man.  
 Galeruca angularis—Monoxia guttulata  
 externa Say.  
 consputa—Monoxia.

flavolimbata—*Trirhabda*.  
 luteocincta—*Trirhabda*.  
 morosa—*Monoxia*.  
 sordida—*Monoxia*.  
 tuberculata—*Gallerucella*.  
*Galerucella notulata* Fabr.  
 marginella Kirby.  
 tuberculata Say.

varicolor—*Colaspidea*.  
*Gonioctena pallida* Linn.  
*Haltica æruginea* Lec.  
 albionica Lec.  
 areola Lec.  
 bimarginata Say.  
 californica Man.  
 carinata Germ.

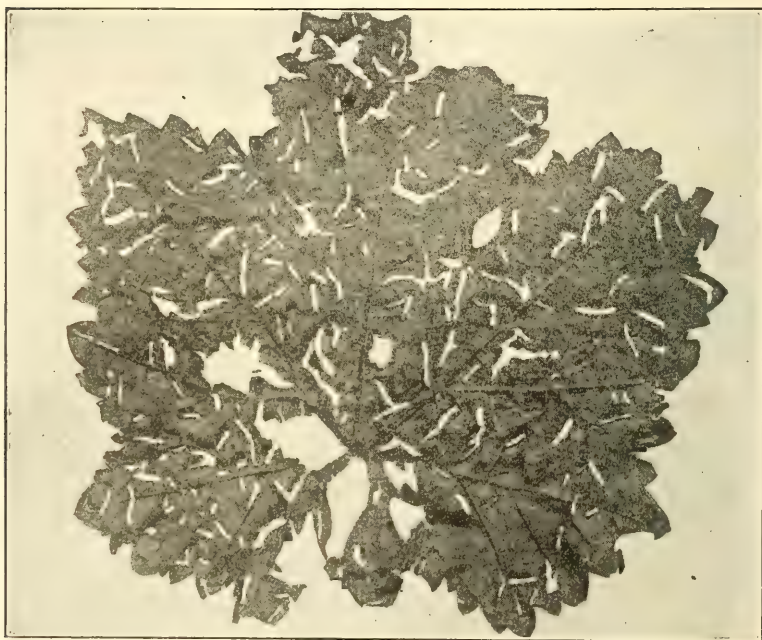


Figure 201. Work of *Adoxus obscurus*.

*Galeruca tuberculata* Say.  
*Gastroidea cæsia*—*cyanea*.  
 dissimilis Say.  
 cyanea (Rog.)  
*Glyptina atriventris* Horn.  
 ceria Lec.  
*Glyptoscellis albidus* Lec.  
 alternatus Cr.  
 cuprascens—*Colaspidea*.  
 illustris Cr.  
 smaragdulus—*Colaspidea*.  
 pubescens Fabr.  
 squamulatus Cr.

cerina Lec.  
 convicta Fall.  
 gracilis Robe.  
 lazulina Lec.  
 lepidula Lec.  
 ligata Lec.  
 limbicollis Lec.  
 maritima Lec.  
 mitis Lec.  
 oblonga Lec.  
 ochracea Lec.  
 opulenta Lec.  
 pilipennis Lec.

- probata Fall.  
 prasina Lec.  
 punctipennis Lec.  
 pura Lec.  
 recticollis Lec.  
 seminulum Lec.  
 subglobosa Lec.  
 suborinita Lec.  
 subænia Lec.  
 suspecta Fall.  
 tegularis Robe.  
 tincta Lec.  
 tombacina Man.  
 torquata Lec.  
 verticalis Robe.  
 Henniglyptus basalis Cr.  
 Lema nigrovittata Guer.  
 Leptothrix recticollis Lec.  
 11-lineta  
 Lina californicus—Melasoma.  
 lapponica—Melasoma.  
 Longitarsis californicus Mots.  
 livens Lec.  
 mancus Lec.  
 montigagus Horn.  
 repandus Lec.  
 rufescens Horn.  
 Luperodes bivittatus Lec.  
 curvatus Fall.  
 crassicornis Fall.  
 laticeps Horn.  
 morrisoni Jac.  
 smaragdinus Lec.  
 torquatus Lec.  
 transitus Horn.  
 varipes Lec.  
 Luperus abdominalis  
 bivittatus—Luperodes.  
 flavicornis—Scelolyperus.  
 graptoderoides—Scelolyperus.  
 longulus—Scelolyperus.  
 maculicollis—Scelolyperus.  
 smaragdinus—Luperodes.  
 thoracicus Boh.  
 torquatus—Luperodes.  
 Malachorhinus maculatus Lec.  
 Mantura floridana Cr.  
 Megalostomus mucorea—Coscinoptera.  
 Megistops quadrimaculata Boh.  
 Melasoma californica Rog.  
 Metachroma californica Cr.  
 peninsularis (Lower California).  
 Metacycla insolita Lec.  
 Microrhapala melsheimeri Cr.  
 rubroliniata Man.  
 signaticollis Lec.  
 Monoxia angularis Lec.  
 consputa Lec.  
 debilis Lec.  
 guttulata Lec.  
 puncticollis Say.  
 sordida Lec.  
 Myochrous angulus Lec.  
 Myocoryna 11-lineata Cr.  
 Myoctrous longulus Lec.  
 Odontata californica Horn.  
 hardyi Cr.  
 rubra Web.  
 Œdionychus fimbriata Forst.  
 longula Har.  
 violascens Lec.  
 Orchestris ramosa—Phyllotreta.  
 Orsodachna atra (Ahr.)  
 Orthallia recticornis—Leptothrix.  
 Pachnephorus smaragdulus—Glypto-  
 scellis.  
 pidea.  
 Pachybrachys analis Lec.  
 circumcinctus Cr.  
 cœlatus Lec.  
 donneri Cr.  
 hybridus Sch.  
 livens Lec.  
 lustrans Lec.  
 melanostictus Sch.  
 signatifrons Man.  
 viduatus Fabr.  
 Paria canella Fabr.  
 6-notatus Say.  
 Phædon oviformis Lec.  
 Phyllobrotica flavicollis—Scelolyperus.  
 luperina Lec.  
 nigripes Horn.  
 viridipennis Lec.  
 Phyllotreta albionica Lec.  
 denticornis Horn.  
 lepidula Lec.  
 lewisii Cr.  
 oregonensis Cr.  
 pusilla Horn.  
 ramosa Cr.  
 vittata Fabr.  
 Plagiodera lapponica Linn.  
 Psylloides convexior Lec.  
 interstitialis Lec.  
 parvicollis Lec.  
 punctatula Mels.  
 Saxinus bisignata—saucia.  
 politula Horn.  
 saucia Lec.  
 speculifera Horn.  
 Scelolyperus decipiens Horn.



- flavicollis* (Lec.)  
*graptoderoides* (Cr.)  
*longulus* (Lec.)  
*loripes* Horn.  
*maculicollis* (Lec.)  
*schwartzii* Horn.  
*tejonicus* Cr.  
*Stenopodius flavidus* Horn.  
*Synecephalus autumnalis* Fall.  
*Syneta albida* Lec.  
     *carinatus* Man.  
     *serinata*—*albida*.  
     *simplex* Lec.  
     *suturalis*—*albida*.  
*Systema ligatus*—*tæniata*.  
     *mitis*—*tæniata*.  
     *ochracea*—*tæniata*.  
     *pallidula* Boh.  
     *subænea* Lec.  
     *tæniata* Say.
- Teinodactyla californica* Mots.  
*Thricolema anomala* Cr.  
*Trimarcha intricata* Hald.  
*Trachycelida bicolor* Lec.  
*Trirhabda attenuata* Say.  
     *caduca* Horn.  
     *canadensis* Kirby.  
     *eriodictyonis* Fall.  
     *diducta* Horn.  
     *flavomarginata* Man.  
     *germinata* Horn.  
     *labrata* Fall.  
     *luteocincta*—*flavomarginata*.  
     *tomentosa* Linn.  
*Typophorus oregonensis*—*Colaspis*.  
     *vividicyaneus* Cr.  
*Xanthonia villosula* Mels.  
*Zeugophora abnormis* Lec.  
     *californica* Cr.

## CERAMBYCIDÆ.

The members of this family are known as long horned wood borers. Most of the species confine themselves to the wood of a single kind of tree. The following food habits are known:—

**Coniferæ** *Anthophilax*. **Pine** *Acanthocinus*, *Aseum*, *Callidum hirtellum*, *Haplidus*, *Leptura brevicornis*, *grossa*, *insignis*, *valida*, *Monohammus maculosus*, *titillator*; *Pogonocherus californicus*, *Rhagium Tragosonia*, *Ulochætes*. **Fir** *Callidium*, *Clytus*, *Criocephalus* *Hylotrupes litigiosus* *Leptura oblitterata*, *propinqua*, *Monohammus scutellatus*, *Pachyta liturata*, *monticola*, *Phymatodes varius*, *Pogonocherus oregonus*, *Tetriopium*, *Tragosonia*, *Xylotrechus undulatus*. **Spruce** *Hylotrupes ligneus*, *Leptura carbonata*, *nigrella*, *propinqua*, *sexmaculata*, *Neoclytus muricatus*, *Opsimus*, *Pachyta spurca*, *Phymatodes* *des*. **Redwood** *Leptura impura*, *matthewsii*, *Phymatodes nitidus*. **Willow** *Leptalia*, *Ipochus*, *Saperda* *hornii*, *Xylotrechus insignis*, *oblitteratus*. **Poplar** *æneus*, *variabilis*. **Cedar** *Atimia*, *Hylotrupes*, *Leptura matthewsii*, *Phymato-Hyperplatys*, *Ipochus*, *Saperda populnea*, *Synaphœta*, *Xylotrechus annosus*. **Oak** *Elaphidion*, *Ipochus*, *Phymatodes decussatus*, *obscurus*, *Pogonocherus crinitus*, *Prionus*. **Walnut** *Phymatodes juglandis*, *Synaphœta*. **Laurel** *Leptura crassipes*, *Holopleura*. **Eucalyptus** *Leptura crassipes*, *Necydalus*. **Manzanita** and **Madrone** *Neoclytus conjunctus*. **Ceanothus** *Ipochus*. **Alder** *Pyrotrichus*. **Mesquite** *Tragidion annulatum*. **Yucca** *Tragidion armatus*. **Cactus** *Cœnopœus*, *Monilema*. **Blueberry** *Desmocerus californicus*. **Redberry** *Desmocerus cribripennis*. **Mt. Elder** *Desmocerus auripennis*. **Apple** *Hyperplatys*, *Milkweed* *Tetraopes*.

## SYNOPSIS OF GENERA.

*Leptura*: front coxæ conical, eyes not enveloping base of antennæ, front

oblique or horizontal first joint of hind tarsi without brush. **Desmocerus** and **Necydalus**: mandibles not fringed, the latter with elytra very short. **Strangalia**: last ventral segment of male deeply excavated

**Phymatodes**: front coxæ transverse, prothorax not margined. **Aseum**, **Tetropium**, **Opsimus** and **Dicentrus**: ligula horny, the last two with prothorax emarginate, the second with four eyes, the third with femora clavate. **Xylocrinus**: mesonotum punctured and pubescent. **Callidium**: mesonotum polished with scattered punctures. **Hylotrupes**: prosternum broad.

**Acmæops**: front coxæ conical, eyes not enveloping base of antennæ, front oblique or horizontal. **Rhagium**: prosternum prominent between the coxæ. **Centrodera**: eyes coarsely granulated. **Toxotus**: tibial spurs not terminal. **Pachyta** and **Anthophylax**: prothorax acutely armed on sides, the latter strongly emarginate.

**Crossidius**: scutellum acutely triangular. **Stenosphenus**: front coxal cavities open. **Dendrobis**, **Tragidion**, **Metaleptus**, **Purpuricenus**, **Ammanus** and **Batyle**: mandibles not emarginate at tip, the first with prosternum broadly lobed at base, the last two with front short, the third with pubescence concolorous with punctures, the fourth with body glabrous and the last with body pilose. **Ischnocnemis**: with ivory vittæ. **Oxoplus**: prothorax with acute lateral spine.

**Xylotrechus**: tibial spurs large. **Cyllene** and **Calloides**: intercoxal process rounded, the first with pronotum transversely excavated at sides. **Neoclytus**: front quadrate. **Clytus**: head not carinate.

**Monilema**: front tibiæ sulcate on inner side, humeral angles not prominent. **Ipochnus**: body densely pilose.

**Pogonocherus**: front tibiæ sulcate on inner side, front coxæ not protuberant. **Monohammus** and **Synaphœta**: scape of antennæ with apical scar, the former with body elongate. **Acanthoderes**, **Cænopocus**, **Hyperplatys** and **Acanthocinus**: front coxæ rounded, the first with scape of antennæ clavate, the second with lateral tubercle of thorax at middle, the third with a long ovipositor. **Lipsimena**: middle tibiæ without external sinus.

**Tetraopes**: last joint of palpi cylindrical and pointed. **Idomea** and **Methia**: elytra abbreviated, the antennæ of the latter apparently ten-jointed. **Saperda**: all claws simple. **Oberea**: with two eyes.

**Elaphidion**: prothorax not margined. **Atimia**: stridulating plate divided. **Pœcilobrium**, **Hybodera**, **Callimus**, **Megobrium**, **Molorchus** and **Callimoxys**: front coxal cavities closed behind, the first four with first abdominal segment very long, the first with palpi broadly triangular, the second with punctures fine, the third with mesosternum wide, the last with hind tibiæ curved inwards. **Malachopterus**, **Ceme**, **Eucrossus** and **Haplidus**: ligula horny, the last with palpi slender, the first two with prosternum laminiform, the first with prothorax lobed at base. **Bothrylus**: front coxal cavities angulated. **Aneflus**: antennæ carinate. **Romalium**: metaepisternum narrower behind.

**Prionus**. **Ergates** and **Mallodon**: prothorax pleuridentate, the first with

third antennal joint very long. **Tragosoma**: metaepimera narrowed behind  
**Derobrachus**: antennæ filiform.

**Acanthocinus obliquus** Lec.  
**spectabilis** Lec.

**Acanthoderes peninsularis** (L.Calif.)

**Acmæops basalis** Lec.

**falsa** Lec.

**fuscus**—**tumida**.

**lisa**—**Leptura gnathodes**.

**longicornis** Kirby.

**lugens**—**tumida**.

**marginalis** Lec.

**militaris** Lec.

**pinguis** Lec.

**pratensis** Laich.

**proteus** Kirby.

**subæneus** Lec.

**subcyanea**—**tumida**.

**subpillosa** Lec.

**tumida** Lec.

**variepes** Cas.

**vincta** Lec.

**viola** Lec.

**Ædilis obliquus**—**Acanthocinus**.

**Amannus pectoralis** Lec.

**Aneflomorpha longipennis**—**Elaphidion**.

**Anaflux linearis** Lec.

**prolixus** (Lower California.)

**protensis** (Lower California). . .

**Anocomus ampla**—**Hylotrupes ligneus**.

**Anthophilax tenebrosus** Lec.

**Asemum atrum** Esch.

**nitidum** Lec.

**Atimia confusa** Say.

**dorsalis** Lec.

**Atimia confusa** (not California).

**Batyle suturalis** Say.

**Brothylus conspersus** Lec.

**gemulatus** Lec.

**Callichroma œneum**—**Callidium**.

**agassii**—**Xylocrius**.

**amethestinus**—**Hylotrupes**.

**blandum**—**Phymatodes**.

**Callidium antennatum** Newm.

**decussatum**—**Phymatodes**.

**hirtellum** Lec.

**infuscatum**—**Phymatodes**.

**janthinum** Lec.

**hesperum**—**antennatum**.

**californicum**—**antennatum**.

**mannerheimi**—**Phymatodes** dim-

**idiatum**.

**obscurum**—**Phymatodes**.

**varium**—**Phymatodes**.

**vile** Lec

**vulneratum**—**Phymatodes**.

**Callimoxys fuscipennis** Oliv.

**sanguinicollis**—**fuscipennis**.

**Callimus cyanipennis** (Lec.)

**chalybæus**—**Pœcilobrium**.

**longicollis**—**ruficollis**.

**opacipennis**—**ruficollis**.

**varipes**—**ruficollis**.

**dehiscens**—**ruficollis**.

**ruficollis** (Lec.)

**Calloides lorquini** Bug.

**Compasa quadriplagiata** (not Calif.)

**puncticollis** (not California).

**Centrodera nevadica** Lec.

**Clytus conjunctus**—**Neoclytus**.

**lanifer** Lec.

**lorquini**—**callicedus**.

**planifrons** Lec.

**nauticus**—**Xylotrechus**.

**Cœnopœus palmeri** Lec.

**niger** (Lower California).

**Criocephalus asperatus** Lec.

**productus** Lec.

**Crossidius ater** Lec.

**discoideus** Say.

**hirtipes** Lec.

**intermedius** Ulke

**maculicollis**—**testaceus**.

**pulchellus** Lec.

**punctatus** Lec.

**testaceus** Lec.

**Cyllene antennatus** White.

**crinicornis** Chev.

**Ceruchus punctatus** Lec.

**Dendrobium mandibularis** Serv.

**reductus**—**mandibularis**.

**Derobrachus germinatus** Lec.

**Dysphaga debilis** (Lower California).

**Desmoei**—**auripennis** Chev.

**californicus** Horn.

**cribripennis** Horn.

**Dicentrus bluthneri** Lec.

**sexnotata**—**bluthneri**.

**Euburia ulkei** (Lower California). . .

**Elaphidion albafasciatum** Lin.

**imbelle** Lec.

**punctatum** Lec.

**Eustroma validum** Lec.

**Euderes parallelus** (not California).

**Eucreesus villicornis** Lec.

**Eudistenia costipennis** Fall.

**Eustroma validum** Lec.

**Eumichthus œdipus** Lec.

- Ganimus vittatus*—*Malachopterus*.  
*Gaurotes cressoni* Bland.  
*Haplidus testaceus* Lec.  
*Holopoleura helenæ* Lec.  
     *marginata*—*helenæ*.  
*Hyboderæ debilis*—*tuberculata*.  
     *tuberculata* Lec.  
*Hylotrupes amethystinus* Lec.  
     *litigiosus* Cas.  
     *ligneus* Fabr.  
*Hyperplatys aspersus* (Say).  
     *californicus*—*aspersus*.  
*Idoemea californica* Fall.  
*Ipochus fasciatus* Lec.  
     *pubescens*—*fasciatus*.  
     *subnitidus*—*fasciatus*.  
*Ischnocnemis bivittatus* Dup.  
*Lamia aspersus*—*Hyperplatys*.  
*Leptalia macelenta* Man.  
*Leptostylus palmeri*—*Cænopæus*.  
     *nebulosus* Horn.  
*Leptura aspera* Lec.  
     *barbaræ* Fall.  
     *behrensii* Lec.  
     *brevicornis* Lec.  
     *carbonata* Lec.  
     *chrysocoma* Kirby.  
     *coccinea* Lec.  
     *convexa*—*instabilis*.  
     *coquilletti* Lin.  
     *crassicornis*—*crassipes*.  
     *crassipes* Lec.  
     *cubitalis*—*Acmæops*.  
     *dehiscens* Lec.  
     *dolorosa* Lec.  
     *fusciventris*—*crassipes*.  
     *fuscicollis* Lec.  
     *gnathoides* Lec.  
     *grossa* Lec.  
     *impura* Lec.  
     *insignis* Fall.  
     *instabilis* Hald.  
     *kerniana* Fall.  
     *læta* Lec.  
     *lætifica* Lec.  
     *lugens* Lec.  
     *matthewsii* Lec.  
     *molybdica* Lec.  
     *nigrella* Say.  
     *obliterata* Hald.  
     *pernigra* Lin.  
     *plagifera* Lec.  
     *propinqua* Bland.  
     *quadrulum* Lec.  
     *rhodopus* Lec.  
     *ruficeps*—*subargentata*.  
     *rubida* Lec.  
     *ruficollis* (not California).  
     *sanguinea* Lec.  
     *scripta* Lec.  
     *sexmaculata* Linn.  
     *sexspilota* Lec.  
     *soror* Lec.  
     *sphæricollis* (not California).  
     *subargentata* Kirby.  
     *subcostata* Fall.  
     *tribalteata* Lec.  
     *valida* Lec.  
     *vexatrix* Man.  
     *vitiosa*—*obliterata*.  
     *xanthogaster*—*crassipes*.  
*Lisemum mokelumne*—*Asemum nitidum*.  
*Lianema tenuicornis* (Lower Calif.)  
*Lilonotus multifasciatus* Dup.  
*Lypsimena californica* Horn.  
*Malachopterus lineatus* Guer.  
     *vittatus*—*lineatus*.  
*Mallodon mandibularis* Gem.  
     *melanopus* Linn.  
*Malthopia oculata*—*Aneflus linearis*.  
*Mathopia oculata*—*Aneflus linearis*.  
*Mecas inornatus* Say.  
*Mecotetarsus antennatus* Bates.  
*Megobrium edwardsii* Lec.  
*Metaleptus angulatus* Chev.  
     *batesi* Horn.  
*Methua æstiva* Fall.  
*Monilema semipunctatum* (L. Calif.)  
     *spoliatum* Horn.  
     *subrugosum* (Lower California.)  
*Molorchus longicollis* Lec.  
*Monohaminus maculosus* Hald.  
     *scutellatus* Say.  
     *titillator* Fabr.  
*Necydalus barbaræ* Riv.  
     *cavipennis* Lec.  
     *lævicollis* Lec.  
*Neoclytus balteatus* Lec.  
     *carus* Fall.  
     *conjunctus* Lec.  
     *infans*—*muricatus*.  
     *interruptus* Lec.  
     *irroratus* Lec.  
     *magnus* Sch.  
     *modestulus* Fall.  
     *muricatus* Kirby.  
     *tenuiscriptus* Fall.  
     *tularensis*—*conjunctus*.  
     *schaumii* Lec.

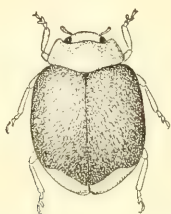
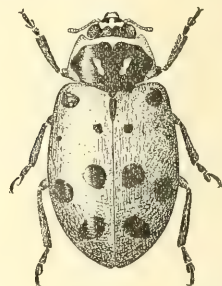
- Nothorhina aspera* Lec.  
*Oberea quadricollis*—*schaumii*.  
     *schaumii* Lec.  
     *tripunctata* (not California.)  
*Æmea costata* Lec.  
     *strangulata* Horn.  
     *gracilis* Lec.  
*Omoscyon subrugosum*—*Monilema*.  
*Ophistomis ventralis* Horn.  
*Opsimus quadrilineatus* Man.  
*Oxoplus cruentus* Lec.  
     *jocosus* Horn.  
     *marginatus* (Lower California).  
*Pachyta falsa*—*Acmæops*.  
     *litrata* Kirby.  
     *monticola* Rand.  
     *proteus*—*Acmæops*.  
     *spurcata* Lec.  
     *lubænea*—*Acmæops*.  
*Paraclytus brevitarsis*—*Clytus lanifer*.  
     *lanifer*.  
*Perarthus vittatus* Lec.  
*Peritapnia nudicornis* (Lower Calif.)  
*Phymatodes æneus* Lec  
     *blandus* Lec.  
     *concinus*—*vulneratus*.  
     *crucialis*—*Clytus lanifer*.  
     *crucialis*—*nitidus*.  
     *decussatus* Lec.  
     *dimidiatus* Kirby.  
     *elegans*—*nitidus*.  
     *exilis*—*nitidus*.  
     *grandis*—*obscurus*.  
     *harfordi*—*decussatus*.  
     *infuscatus*—*variabilis*.  
     *juglandis* Leng.  
     *nitidus* Lec.  
     *obliquus*—*decussatus*.  
     *obscurus* Lec.  
     *variabilis* Linn.  
     *varius* Fabr.  
     *vulneratus* Lec.  
*Physocnemum amesthinum*—*Hylotrupes*.  
     *pes*.  
*Phyton discoideum* (Lower California).  
*Pilema cyanipenne*—*Callimus*.  
*Pœcilobrium chalybeum* Lec.  
     *ruficollis*—*Callimus*.  
*Pogonocherus californicus* Sch.  
     *rugosipenne* Lin.  
     *crinitus* Lec.  
     *concolor* Sch.  
     *mixtus* (not California).  
     *oregonus* Lec.  
*Prionus ambricornis*—*californicus*.  
     *concolor* (undetermined).  
     *violans* (Lower California).  
     *laticollis* (not California).  
*Purpuricenus dimidiatus* Lec.  
*Pyrotrichus vitticollis* Lec.  
*Ptychodes trilineatus* (Lower Calif.)  
*Rhagium liniolatum* Oliv.  
*Rhopalophora*—*rugicollis* (L. Calif.)  
     *bicincta* (Lower California).  
*Romalium seminitidum* Horn.  
     *simplicicollis* Hald.  
*Rosalia funebris* Mots.  
*Saperda hornii* Jou.  
     *mœsta* (not California).  
     *mutica* (not California).  
     *populnea* Linn.  
*Semanotus amethystinus*—*Hylotrupes*.  
     *ligneus*—*Hylotrupes*.  
*Sphænothecus suturalis* Lec.  
*Stenaspis solitaria* (Lower California).  
*Stenoptarsis fuscipennis*—*Callimoxys*.  
*Stenosphenus novatus* Oliv.  
*Strangalis delicata* Lec.  
*Styloxus lucanus* (Lower California).  
*Synaphœta guexi* Lec.  
*Tetraopes basalis*—*femoratus*.  
     *femoratus* Lec.  
     *mancus*—*femoratus*.  
     *oregonensis*—*femoratus*.  
     *elegans* (Lower California).  
*Tetropium cinnamopterum* (not Calif.)  
     *velutinus* Lec.  
*Toxotus flavilineatus*—*vestitus*.  
     *lateralis*—*vestitus*  
     *nubifer*—*vestitus*.  
     *vestitus* Hald.  
     *virgatus* Lec.  
*Tragidion annulatum* Lec.  
     *armatus* Lec.  
*Tragosonia harrisii* Lec.  
     *pilosicornis*—*harrisii*.  
*Ulochaetes leoninus* Lec.  
*Xylocrius agassizii* Lec.  
     *cribratus* Lec.  
*Xylotrechus albonotata*—*undulata*.  
     *annosus* Say.  
     *disruptus*—*insignis*.  
     *incongruens*—*insignis*.  
     *insignis* Lec.  
     *longitarsis*—*undulata*.  
     *nauticus* Man.  
     *obliteratus*—*insignis*.  
     *planifrons*—*Clytus*.  
     *undulatus* Say.





trifasciata Linn.  
 9-notata Herb.  
 15-notata Kirby.  
 11-punctata Linn.  
*Cryptognatha catalinæ* Horn.  
*pusilla* Lec.  
*Cryptolæmus monstrouzieri* Muls.

fasciatus Cas.  
 histrio—*Brumus*.  
*marginipennis* Lec.  
*pilatei*—Axion.  
*Harmonia picta* Rand.  
*Hippodamia ambigua* Lec.  
*apicalis* Cas.

Figure 204. *Cryptolæmus monstrouzieri*.Figure 205. *Hippodamia convergens*.Figure 206. *Hippodamia ambigua*.

*Cycloneda abdominalis*—*Olla oculata*.  
*catalinæ*—*Cryptognatha*.  
*oculata*—*Olla*.  
*polita*—*sanguinea*.  
*rubripennis*—*sanguinea*.  
*sanguinea* Linn.  
*Delphastus catalinæ* Horn.  
*sonoricus* Cas.  
*Didion longulum* Cas.  
*parviceps* Cas.  
*Epilachna corrupta* Muls.  
*Eriopis connexa* Germ.  
*Exochromus californicus* Cas.  
*childreni* Muls.

*convergens* Guer.  
*erotchii*—*convergens*.  
 12-punctata  
*extensa*—*convergens*.  
*juncta*—*convergens*.  
*lecontei* Muls.  
*mæsta* Lec.  
*obsoleta*—*convergens*.  
*obliqua*—*convergens*.  
*parenthesis* Say.  
 5-signata Kirby.  
*prolitissima*—*convergens*.  
*punctulata*—*ambigua*.  
*sinuata* Muls.

*spuria* Lec.  
*subsimilis*—5-signata.  
*13-punctata* Linn.  
*trivittata*—*sinuata*.  
*Hyperaspis angustula* Cas.  
*annexa* Lec.  
*annulatus* Boh.  
*arcuata* Lec.  
*cincta* Lec.  
*dissoluta* Cr.  
*effeta* Cas.  
*ellyphica* Cas.  
*excelsa* Cas.  
*fastidiosa* Cas.  
*fidelus* Cas.  
*fimbriolata* Mels.  
*horni*—4-*oculata*.  
*idæ* Nun.  
*8-notata*.



Figure 207. *Hyperaspis*, 8-notata.

*Linedorus lophenthus* Ria.  
*Megilla maculata* DeG.  
*Mæmie episcopalis* Kirby.  
*Mysia horni*—*Neomysia*.  
*Neomysia horni* Cr.  
*Nipus biptagiatus* Cas.  
*niger* Cas.  
*Novius cardinalis* Muls.



Figure 208. *Novius cardinalis*.

*koebelei* Oliv.



Figure 209. *Novius koebelei*.  
*Olla abdominalis*—*oculata*.  
*oculata* Fabr.

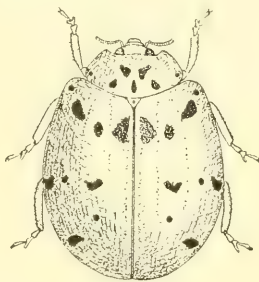


Figure 210. *Olla oculata*.

*Olla plagiata* Cas.



Figure 211. *Olla plagiata*.



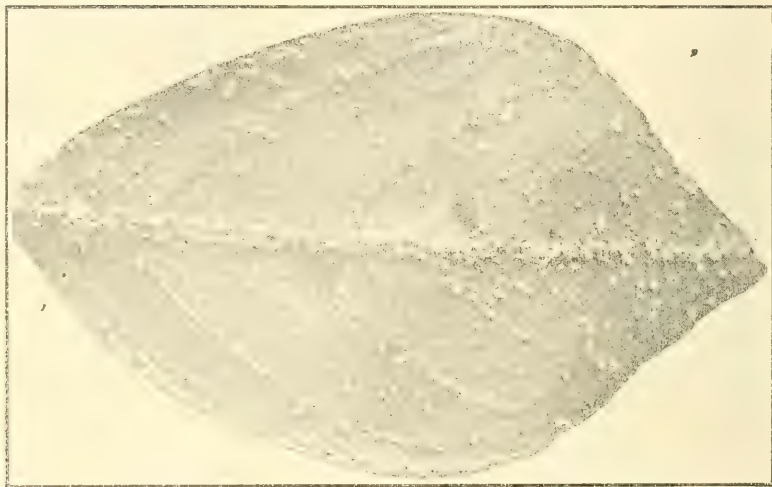


Figure 212. Young Cottony Cushion Scales on orange leaf. Larva and adult of the Australian ladybird, *Novius cardinalis*, beetle also shown feeding upon the scales.

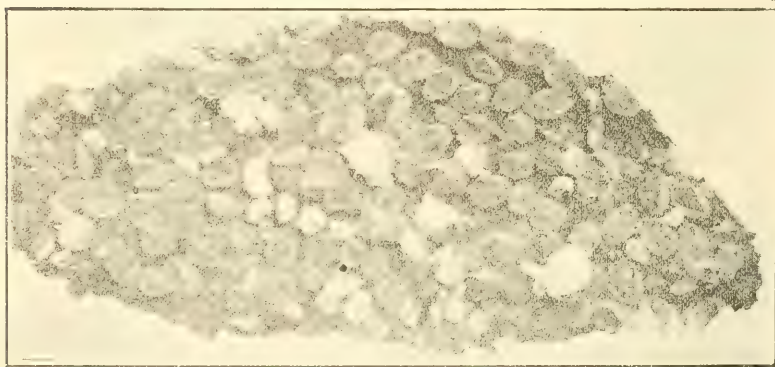


Figure 213. Pupae of *Novius cardinalis* on orange tree.

*Orcus australasiæ* Boisd.  
*chalybeus* Bois.



Figure 214. *Orcus chalybeus*.

*Psyllobora deficiens* Cas.  
*Rhizobius lophanthæ* Bla.

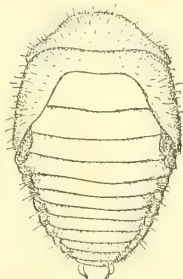
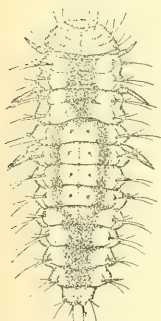


Figure 215. *Rhizobius lophanthæ*.  
*ventralis* Er.

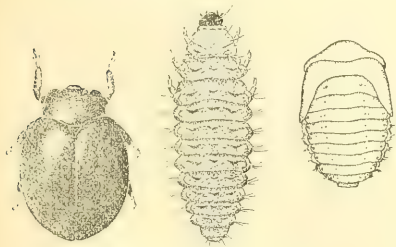


Figure 216. *Rhizobius ventralis*.

*separata* Cas.  
*tædata*—20—*maculata*.  
20—*maculata*

*Ccymnillus aterrimus* Horn.  
*Scymnus adventa* Cas.

*aluticollis* Cas.  
*ardelio* Horn.  
*atramentarius* Boh.  
*bisignatus* Horn.  
*blaisdelli* Cas.  
*calaveras* Cas.  
*californicus* (undetermined.)  
*caurinus* Horn.  
*cervicallis* Cas.  
*cinctus* Lec.  
*collaris* Cas.  
*coniferarum* Cr.  
*debilis* Lec.  
*difficilis* Cas.  
*extricatus* Cas.  
*flebilis* Horn.  
*guttulatus* Lec.  
*humboldti* Cas.  
*infuscatus* Lec.  
*jacinto* Cas.  
*jacobianus* Cas.  
*lacustris* Lec.  
*lecontei*—*cinctus*.  
*lophanthæ* Ril.  
*luctuosus* Cas.  
*marginicollis* Man.



Figure 217. *Scymnus marginicollis*.

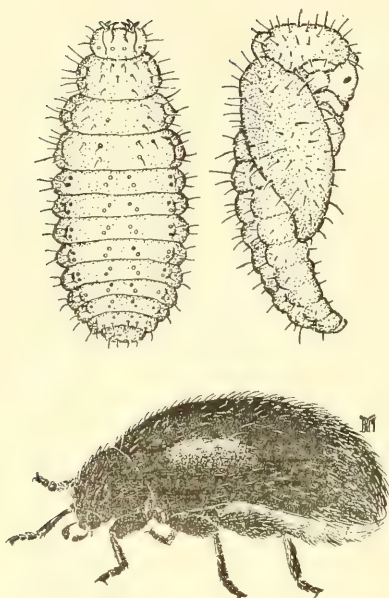
*mendocino* Cas.  
*mimus* Cas.  
*namus* Lec.  
*nebulosus* Lec.



Figure 218. *Scymnus nebulosus*.

*pacificus* Cr.  
*pallens* Lec.



Figure 219. *Stethorus picipes*.

*phlepsii* Cr.  
*punctum* Lec.  
*saginat* Cas.  
*sarpeton* Cas.  
*scitus* Cas.  
*solidus* Cas.  
*sonomæ* Cas.  
*sordidus* Horn.  
*strenuus* Cas.  
*stygius* Cas.  
*suavis* Cas.  
*suturalis* Lec.  
*tædatus* Cas.  
*tahoensis* Cas.  
*tenuivestris* Cas.  
*ovalis* Lec.  
*platyceps* Cas.  
*reversa* Cas.  
*picipes* Cas.

*Smilia atronitens* Cas.  
*Stethorus picipes* cas.  
*Vedalia cardinalis*—Novius.  
*Zagloba ornata* Horn.  
*laticollis* Cas.  
*orbipennis* Cas.

## LATHRIDIIDÆ.

*Bonvouloiria parviceps*—*Metophtalmus*.  
*Calyptobium caularum*—*Holoparamicus*.  
*Cartodere argus* Reit.  
     *quadrifoveolata* Fall.  
*Conionomus australicus* Bel.  
     *constrictus* Gyll.  
     *nodifer* Westw.  
*Corticaria compta*—*Melanophthalma americana*.  
     *cylindrinota* (undetermined).  
     *elongata* Gyll.  
     *expansa*—*Melanophthalma americana*.  
     *ferruginea* Marsh.  
     *fulvinennis* (undetermined).  
     *herbivagans*—*Melanophthalma similata*.  
     *inopia* Fall.  
     *lævis*—*Melanophthalma americana*.  
     *morosa*—*Melanophthalma distinguenda*.

*occidua* Fall.  
*planula* Fall.  
*prionodera*—*serrata*.  
*pusilla*—*Melanophthalma distinguenda*.  
*rutula*—*Melanophthalma distinguenda*.  
*salpinoides* Mots.  
*scissa*—*Melanophthalma americana*.  
*serrata* Payk.  
*simplex*—*Melanophthalma*.  
*tenella*—*Melanophthalma*.  
*tenuipes* Fall.  
*Dasydercus angusticollis* Horn.  
     *granvelli*—*angusticollis*.  
*Enicmus aterrimus* Mots.  
     *crenatus* (Lec.)  
     *desertus* Fall.  
     *fictus* Fall.  
     *minutus* Linn.  
     *nigritus* Fall.  
     *sulcatus* Fall.  
     *suspectus* Fall.

- tenuicornis* Lec.  
*ventralis* Fall.  
*Fuchsina occulta* Fall.  
*Holoparamecus caularum* (Aube.)  
*kunzei* Aube.  
*pacificus* Lec.  
*singularis*—*kunzei*.  
*Lathridius armatulus* Fall.  
*costicollis*—*flavipennis* Man.  
*crenatus*—*Enicmus*.  
*flavipennis* Man.  
*parviceps*—*Metophthalmus*.  
*tenuicornis*—*Enicmus*.  
*Melanophthalma americana* Man.  
*casta* Fall.
- cylindrinota* (undetermined).  
*distinguenda* Cam.  
*gibbosa* Herb.  
*incompta* Fall.  
*insularis* Fall.  
*pusilla* (undetermined).  
*similata* Gyll.  
*simplex* Lec.  
*tenella* (Lec.)  
*villosa* Zim.  
*Metophthalmus parviceps* (Lec.)  
*rudis* Fall.  
*trux* Fall.  
*Revelaria californicus* Fall.

## NITIDULINA

## COLYDIIDÆ.

- Aglenus brunneus* Gyll.  
*Anchomma costatum* Lec.  
*Aulonium æquicolle*—*paralleopipedum*.  
*longulum* Lec.  
*paralleopipedum* Say.  
*castaneum* Say.  
*simplex*—*castaneum*.  
*Coxelus pacificus* Horn.  
*serratus* Horn.  
*Deretaphrus oregonensis* Horn.
- Ditoma ornata* Lec.  
*sulcata* Lec.  
*complex* Lec.  
*linearis* Cr.  
*pusillus* Lec.  
*servus* Horn.  
*vergrandis* Horn.  
*Oxylæmus californicus* Cr.  
*Rhagodera tuberculata* Man.  
*Synchita variegata* Lec.

## CUCUJIDÆ.

- Brontes debilis* (not California)  
*dubius* Fabr.  
*truncatus*—*dubius*.  
*Cathartus advena* (Waltl.)  
*opaculus* Lec.  
*Cryptophagus advena*—*Cathartus*.  
*Cucujus clavipes*.  
*ferrugineus*—*Læmophlæus*.  
*pusillus* *Læmophlæus*.  
*puniceus*—*clavipes*.  
*Dermestes surinamensis*—*Silvanus*.  
*Læmophlæus bigutatus* Say.  
*cephalotes* Lec.  
*ferrugineus* (Steph.)  
*horni* Cas.  
*longicornis* Man.  
*nitens* Lec.  
*puberulus*—*pusillus*.  
*pubescens* Cas.  
*pusillus* Schon.  
*Lathropus dubius*—*Brontes*.
- pubescens* Cas.  
*vernalis* Lec.  
*Narthesius grandiceps*—*striaticeps*.  
*simulator* Cas.  
*striaticeps* Fall.  
*Nausibius clavicornis* Klug.  
*Pediacus depressus* Herbst.  
*fuscus* Er.  
*Prostomis americana* Crotch.  
*mandibularis* Fabr.  
*Silvanus advena*—*Cathartus*.  
*bidentatus* Fabr.  
*gilæ* Cas.  
*imbellis* Lec.  
*mercator* Fauv.  
*nitidulus*—*planatus*.  
*opaculus*—*Cathartus*.  
*planatus* Germ.  
*surinamensis* (Linn.)  
*Telephanus lecontei* Cas.

## BYTURIDÆ.

*Byturus griseus* Lec.

## PHALACRIDÆ.

*Acylomus nebulosus* Cas.

*Eustilbus apicalis* Mels.

*aquatilis* Lec.

*nanulus* Cas.

*notabilis* Fall.

*obtusus* Lec.

*Olibrus aquatilis* Lec.

*obtusus* Lec.

*rufipes* Lec.

*piceus* (undetermined).

*wickhami* Cas.

*Phalacrus conjunctus* Cas.

*ovalis* Lec.

*penicellatus* Say.

## OSTOMIDÆ.

*Alindria teres* Mels.

*Gynocharia pilosula* Crotch.

*oregonus* Cas.

*Nemosoma fissiceps* Fall.

*cylindricum* Lec.

*Peltis ferruginea* Linn.

*pippingskoeldi* Man.

*Pseudalindria fissipes*—*Nemosoma*.

*Temnochila chlorida* Man.

*yuccæ* Cr.

*Tenebroides californica* Horn.

*corticalis* Mels.

*crassicornis*—*mauritanica*.

*intermedia* Horn.

*mauritanica* Linn.

*pleuralis* Horn.

*sinuata* Lec.

*Trogosita californica* — *Tenebroides*

*sinuata*.

*crassicornus*—*Tenebroides*

*mauritanica*.

*intermedia*—*Tenebroides*.

*mauritanica*—*Tenebroides*.

*pleuralis*—*Tenebroides*.

*sinuata*—*Tenebroides*.

*virescens*—*Temnochila chlorida*.

*yuccæ*—*Temnochila*.

*chlorida*—*Temnochila*.

## MONOTOMIDÆ.

*Bactridium striatum* (Lec.)

*striolatum* (Reit.)

*Euroops longicollis* Horn.

*Hesperobæus appreciatus* (Mots.)

*Monotoma marinum*—*Phyconomis*.

*mucida* Lec.

*picipes* Herbst.

*rufipennis*—*Hesperobæus*.

*striatum*—*Bactridium*.

*Phyconomis marinum* Lec.

*Rhisophagus abbreviatus*—*Hesperobæus*.

*striolatum*—*Bactridium*.

## NITIDULIDÆ.

*Amartus rufipes* Lec.

*tinctus* (Man.)

*Athonæus agavensis* (Cr.)

*Brachypterus troglodytes* Murr.

*Carpophilus brachypterus* (Say).

*californicus* Sch.

*caudalis*—*discoideus*.

*decipiens* Horn.

*dimidiatus* (Fabr.)

*rickseckeri* Fall.

*discoideus* Lec.

*hemipterus* Linn.

*niger* (Say.)

*pallipennis* (Say.)

*yuccæ* Cr.

*Cercus niger*—*Carpophilus*.

*pallipennis*—*Carpophilus*.

*sericans* Lec.

*Cybocephalus californicus* Horn.

*Epuræa ambigua* Man.

*avara* (Rand.)

*brachypterus*—*Carpophilus*.

*decipiens*—*Carpophilus*.

*dimidiatus*—*Carpophilus*.

*discoideus*—*Carpophilus*.

*hemipterus*—*Carpophilus*.

*monogama* Cr.

*niger*—*Carpophilus*.

*nubilia*—*avara*.

- ovata* Horn.  
*pallidipennis*—*Carpophilus*.  
*scaphoides* Horn.  
*truncatella* Man.  
*yuccæ*—*Carpophilus*.  
*Glyschrochilus cylindricus* (Lec.)  
*vittatus* (Say).  
*Ips cylindricum*—*Glyschrochilus*.  
*vittatus*—*Glyschrochilus*.  
*Meligethes brassicæ* Scop.  
*Nitidula avara*—*Epureæ*  
*brachypterus*—*Carpophilus*.  
*dimidiatus*—*Carpophilus*.  
*humeralis*—*ziczac*.  
*rufimanus* Lec.  
*runcatus*—*Colastus*.  
*ziczac* Say.  
*Omosita discoidea* Fabr.  
*inversa*—*discoidea*.  
*Perthalyora murrayi* Horn.  
*Pithyophagus rufipennis* Horn.  
*Pocadius dorsalis* Horn.  
*Rhizophagus abbreviatus* Mots.  
*puncticollis* Boh.  
*scalphiratus* Man.  
*Smicrips hypocopoides* Reit.  
*Strangylus tinctus*—*Amartus*.  
*Tribrachys caudalis*—*Carpophilus*.

CRYPTOPHAGIDÆ.

- Atomaria fuscicollis* Man.  
*lætula* Lec.  
*Cryptophagus californicus* Man.  
*cellaris* Scop.  
*debilis* Lec.  
*lecontei* Gem.  
*Henoticus serratus* Gyll.

EROTYLIDÆ.

- Dachne californica* (Horn.)  
*picea* Lec.  
*Engis californica*—*Dachne*.  
*Erotylus boisduvali* Chev.  
*californica*—*Tritroma*.  
*Languria californica* Fall.  
*convexicollis* Horn.  
*Triplax californica*—*Tritroma*.  
*Tritroma californica* Lec.

MYCETOPHAGIDÆ.

- Beetles of this family feed on fungi.  
*Berginus pumilus* Lec.  
*Litargus balteatus* Lec.  
*transversus*—*balteatus*.  
*Mycetophagus californicus* Horn.  
*Myrmechixemis latridioides* Cr.  
*Triphyllus elongatus* Lec.  
*Tryphœa fumata* Linn.

DERMESTINA.

BYRRHIDÆ.

- Amphicyrta chrysomelina* Er.  
*dentipes* Er.  
*elongata*—*dentipes*.  
*gentilis*—*dentipes*.  
*oblonga*—*dentipes*.  
*parvuliceps*—*dentipes*.  
*ventricosus*—*dentipes*.  
*Bothriophorus minutus* Lec.  
*Byrrhus cyclophorus* Kirby.  
*Cyrtillus mimeticus*—*sericeus*.  
*sericeus* Forst.  
*Limnichus analis* Lec.  
*californicus* Lec.  
*densissimus* Cas.  
*evanescens* Cas.  
*naviculatus* Cas.  
*nebulosus* Lec.  
*perforatus* Cas.  
*perpolitus* Cas.  
*tenuicornis* Cas.  
*Pedilophorus formosus* Cas.  
*oblongus* Lec.  
*satelles*—*formosus*.  
*Simpliocaria inflata*—*simplicipes*.  
*simplicipes* Man.  
*puncticeps*—*simplicipes*.

## NOSODENDRIDÆ.

*Nosodendron californicum* Horn.

## DERMESTIDÆ.

The Dermestidæ feed on dried animal matter such as museum specimens and are sometimes troublesome by attacking hams and bacon.

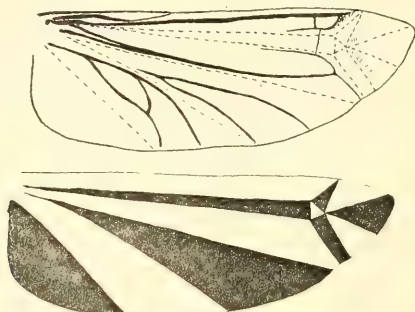


Figure 220. Wing of a Dermestid beetle.\*

- |   |  |
|---|--|
| <i>Anthrenus apicalis</i> — <i>Crypterhopalum</i> . | <i>ruficorne</i> Lec.                      |
| <i>conspersus</i> — <i>scrophulariæ</i> .           | <i>tristis</i> Lec                         |
| <i>lepidus</i> — <i>scrophulariæ</i> .              | <i>Dermestes caninus</i> Germ.             |
| <i>obtectus</i> — <i>scrophulariæ</i> .             | <i>carnivorus</i> Fabr                     |
| <i>occidens</i> — <i>scrophulariæ</i> .             | <i>cylindricum</i> — <i>Perimegatoma</i> . |
| <i>pictus</i> — <i>scrophulariæ</i> .               | <i>falsum</i> — <i>Perimegatoma</i> .      |
| <i>scrophulariæ</i> Linn.                           | <i>iardarius</i> Linn.                     |
| <i>suffusus</i> — <i>scrophulariæ</i> .             | <i>lupinus</i> — <i>vulpinus</i> .         |
| <i>varius</i> — <i>verbasci</i> .                   | <i>mannerheimii</i> Lec.                   |
| <i>verbasci</i> Linn.                               | <i>marmoratus</i> Lec.                     |
| <i>Attagenus hornii</i> Jayne.                      | <i>rattus</i> Lec.                         |
| <i>pellio</i> Linn.                                 | <i>signatus</i> Lec.                       |
| <i>perplexus</i> Jayne.                             | <i>talpinus</i> Lec.                       |
| <i>piceus</i> Oliv.                                 | <i>triste</i> (undetermined)               |
| <i>rufipennis</i> Lec.                              | <i>vulpinus</i> Fabr.                      |
| <i>unicolor</i> (undetermined).                     | <i>Orphilis glabratus</i> — <i>niger</i> . |
| <i>Crypterhopalum affine</i> Cas.                   | <i>niger</i> Rossi.                        |
| <i>apicale</i> Man.                                 | <i>subnitidus</i> — <i>niger</i> .         |
| <i>baltatum</i> Lec.                                | <i>Perimegatoma ampla</i> Cas.             |
| <i>filitarse</i> Cas.                               | <i>cylindricum</i> (Kirby).                |
| <i>fuscum</i> Lec.                                  | <i>falsum</i> (Horn).                      |
| <i>nigricorn</i> Lec.                               | <i>jaynei</i> Cas.                         |
| <i>Colastus agavensis</i> — <i>Athonæus</i>         | <i>variegatum</i> Horn.                    |
| <i>limbalis</i> Lec.                                | <i>Trogoderma brevis</i> Cas.              |
| <i>obliquus</i> — <i>truncatus</i> .                | <i>ornatum</i> Say.                        |
| <i>tinctus</i> — <i>Amartus</i> .                   | <i>pollens</i> Cas.                        |
| <i>truncatus</i> (Rand.)                            | <i>simulans</i> Cas.                       |
| <i>yuccæ</i> — <i>Carpophilus</i> .                 | <i>sternale</i> Jayne.                     |
| <i>Conoteles mexicanus</i> Murr.                    | <i>varipes</i> Cas.                        |
| <i>Cryptarcha concinna</i> Mels.                    |  |



*HETEHO CERINA*

## GEORYSSIDÆ.

These beetles live on the margins of streams covering themselves with a mass of wet sand.

*Georyssus californicus* Lec.  
*Dryops productus* Lec.  
     *striatus* Lec.  
     *suturalis* Lec.  
*Elmis divergens* Lec.  
     *foveatus* Lec.  
     *quadromaculatus* Horn.  
     *seriatus* Leec.  
     *productus*—*Dryops*.  
*Helicus gilensis*—*Dryops suturalis*.

PARNIDÆ.  
     *productus*—*Dryops*.  
     *striaus*—*Driops*.  
     *suturalis* *Driops*.  
*Lara avara* Lec.  
*Macronynchus parvulus* Horn.  
*Pelonomus cavifrons* Lec.  
     *haldemanni* Horn.  
*Tnroscinus crotchii* Lec.

## HETERO CERIDÆ.

The members of this family live in burrows in wet sand on the banks of streams.

*Heterocerus brunneus* Mels.  
     *collaris* Kies.  
     *gemmatus* Horn.  
     *gnatho* Lec.  
     *labiatus*—*gnatho*.  
     *luteolus*—*gnatho*.  
     *pusilla* Say.

*HISTERINA*.

## HISTERIDÆ.

The Histeridæ live on dry partly decayed substances both animal and vegetable and are notable by their hard bodies and their habits of retracting their legs into grooves and appearing as dead.

*Abræus bolteri* Lec.  
*Acritus basalis* Lec.  
     *maratimus* Lec.  
     *volitans* Fall.  
*Æletes basalis* Lec.  
*Anapleus compactus*—*marginatus*.  
     *marginatus* Lec.  
*Bacanius globulinus* Cas.  
*Carcinops æqualis* Say.  
     *consors* Lec.  
     *difficilis* Horn.  
     *14-striatus* Steph.  
     *gilensis* Lec.  
     *opuntiae* Lec.  
     *tejonius* Lec.  
     *tenellus* Erich.  
*Dendrophilis californicus* Horn.  
*Epiurus decipiens* Lec.  
     *nasutus* Horn.  
     *planulus* Er.  
     *regularis* Beam.  
*Gnathoncus interceptus*—*Saprinus rotundatus*.  
*Hetærius californicus* Horn.  
     *morosus* Lec.  
     *tristriatus* Horn.  
     *wheeleri* Mann.  
*Hister limaculatus* Linn.  
     *californicus* Mars.  
     *fractifrons* Cas.  
     *gagates* Fall.  
     *lecontei* Horn.  
     *immunis* Er.  
     *lucanus* Horn.  
     *militaris* Horn.  
     *punctiger* Lec.  
     *remotus* Lec.  
     *sellatus* Lec.

- sexstriatus Lec.  
 simplicipes Fall.  
 umbilicus Cas.  
*Hololepta* cacti Lec.  
 bractea Fr.  
 helena Lec.  
 fossularis (not California).  
 marginata Lec.  
 pervalida Bla.  
 populnea Lec.  
 princeps—yucateca.  
 vicina Lec.  
 vulcateca Lec.  
 yucateca Mars.  
*Onthophilus lecontei* Horn.  
*Pachylopus gaudens*—Saprinus.  
 serrulatus—Saprinus.  
*Scaphisoma castaneum* Lec.  
 sulcifrons—Saprinus.  
*Paromalus difficilis* Horn.  
 mancus (undetermined.)  
*Platysoma punctigerum* Lec.  
*Plegaderus consors* Horn.  
 fraternus Horn.  
 molestus (undetermined).  
 nitidus Horn.  
*Saprinus æquipunctatus* Horn.  
 alienus Lec.  
 behrens. Horn.  
 bigemmus Lec.  
 cærulescens Lec.  
 ciliatus Lec.  
 consobrinus Fall.  
 discoidalis Lec.  
 distinguendus Mars.  
 densipunctatus Horn.  
 estriatus Lec.  
 fimbriatus Lec.  
 gaudens Lec.  
 insertus Lec.  
 interceptus—rotundatus.  
 interstitialis Lec.  
 intritus Cas.  
 laridus Lec.  
 lentus Cas.  
 liticollis Fall.  
 lubricus Lec.  
 lucidulus Lec.  
 lugens Er.  
 obductus—lugens.  
 obscurus Lec.  
 opacellus Cas.  
 oregonensis Lec.  
 pæminosus Lec.  
 neglecta Blais.  
 platysma Lec.  
 populnea Lec.  
 patruellis Lec.  
 pectoralis Lec.  
 plenus Lec.  
 propensus Cas.  
 rotundatus Kug.  
 rotundifrons Mars.  
 scissus Lec.  
 sejunctus—distinguendus.  
 serrulatus Lec.  
 sulcifrons Lec.  
 vestitus Lec.  
 vituosus Lec.  
*Teretrius obliquulus* Lec.  
 placitus Horn.  
*Tribalister marginellus* Lec.  
*Tribalis californicus* Horn.

## SCAPHIDIIDÆ.

rufulum Lec.

## TRICHOPTERYGINA

## HYDROSCAPHIDÆ.

*Hydroscapha natans* Lec.

## TRICHOPTERYGIDÆ.

*Trichopteryx californicum* Mat.  
 crotchii Mat.  
 laticollis Maek.

volundala Mots.  
 sitkænsis Mots.  
*Smicrus filicornis* Fair.

## PTILIIDÆ

- |                                 |                          |
|---------------------------------|--------------------------|
| Actidum attenuatum Cas.         | columbianum Mat.         |
| granulosum Cas.                 | humile Mat.              |
| politum Mat.                    | Ptenidium pullum Maek.   |
| robustum Cas.                   | Ptilium collani—Ptenium. |
| Motschulskium sinuaticolle Mat. | columbianum—Ptenium.     |
| Ptilium collani Maek.           |                          |

## SPHÆRIIDÆ.

- Sphærius politus Horn.

## SILPHINA

## SILPHIDÆ.

The Silphidæ are the carrion beetles. A few species have been called burying beetles because of their habit of excavating beneath the dead animal upon which they are feeding and upon which they lay their eggs.

## SYNOPSIS OF GENERA.

- Necrophorus:** antennæ ten-jointed.  
**Silpha:** front coxal cavities widely open behind.  
**Necrophilus.** **Pinodytes:** eyes wanting. **Sphærites:** antennæ capitate.  
**Agyrtes:** epipleural fold narrow. **Pteroloma:** antennæ scarcely thickened at tip. **Pelates:** antennæ arising under a frontal margin.
- |   |   |
|---|---|
| <b>Agyrtes longulus</b> Lec.                | <b>Pelates tenuicorne</b> — <b>Pteroloma.</b> |
| <b>Hister glabratus</b> — <b>Sphærites.</b> | <b>Pinodytes cryptophagoides</b> Man.         |
| <b>Necrophilus hydrophiloides</b> Man.      | pusio (Horn.)                                 |
| confossor— <b>pustulatus.</b>               | <b>Pteroloma tenuicorne</b> Lec.              |
| longulus— <b>Agyrtes.</b>                   | caraboides Fall.                              |
| tenuicorne— <b>Pteroloma.</b>               | <b>Silpha ænescens</b> — <b>ramosa.</b>       |
| <b>Necrophorus guttula</b> Mots.            | californica— <b>lapponica.</b>                |
| marginatus Fabr.                            | lappanica Herb.                               |
| nigritus— <b>pustulatus.</b>                | opaca Linn.                                   |
| <b>pustulatus</b> Hersch.                   | ramosa Say.                                   |
| <b>vespilloides</b> Herb.                   | <b>Sphærites glabratus</b> Fabr.              |
| pollinctor— <b>vespilloides.</b>            | <b>Sphærites pusio</b> — <b>Pinodytes.</b>    |
| <b>Pelates lautus</b> Man.                  |   |

## ANISOTOMIDÆ.

- |   |  |
|---|--|
| <b>Agathidium californicum</b> Horn.            | morula— <b>curvata.</b>                    |
| concinnum Man.                                  | obsoleta (Mels.)                           |
| pulchrum Lec.                                   | paludicola Crotch.                         |
| revolens Lec.                                   | <b>Catops basillaris</b> — <b>Choleva.</b> |
| sexstriatum Horn.                               | californicus— <b>Ptomophagus.</b>          |
| virile Fall.                                    | cryptophagoides— <b>Pinodytes.</b>         |
| <b>Amphicyllis picipennis</b> — <b>Cyrtusa.</b> | pusio— <b>Ptomophagus.</b>                 |
| <b>Anistoma collaris</b> Lec.                   | <b>Choleva basillaris</b> (Say).           |
| curvata Man.                                    | californicus— <b>Ptomophagus.</b>          |
| difficilis Horn.                                | clavatum— <b>Colon.</b>                    |
| humeralis Horn.                                 | inermis— <b>Colon.</b>                     |

luridipennis Man.  
pusio—*Ptomophagus*.  
Colon celatum Horn.  
clavatum Man.  
nevadense Horn.  
inerme Man.  
*Cyrtusa picipennis* (Lec.)  
*Hydnobius latidens* Lec.  
longulus Lec.  
matthewsii Crotch.  
*Liodes confusa* Horn.  
pumilis—*latidens*.

strigilatus Horrn.  
*Pallodes obsoleta*—*Anistoma*.  
*Platycholeus leptinoides* (Crotch).  
*Ptomophagus californicus* (Lec.)  
californiscus (Lec.)  
consobrinus (Lec.)  
fissus Horn.  
leptinoides—*Platycholeus*.  
pusio (Lec.)  
*Triarthron cedonulli*—*lecontei*.  
lecontei Horn.

## CLAMBIDÆ.

*Clambus seminum* Horn.

## SCYDMÆNIDÆ.

*Brachycephs fuchsi* Brend.  
*Catalinus angustus* (Lec.)  
*Cephennium anophthalmicum* Brend.  
*Ceramphus deformata* (Horn.)  
*Connophron digressum* Cas.  
occidens Cas.  
*Drastophus lævicollis* Cas.  
*Eumicris caseyi* Brend.  
*Eutheia colon*—*Veraphis*.  
impressa—*Veraphis*.  
*Lophoderus gracilis* Lec.  
myops Cas.  
ventricose Cas.

*Papusus macer* Cas.  
*Scydmaenus angustatus*—*Catalinus*.  
californicus Mots.  
colon—*Veraphis*.  
deformata—*Ceramphis*.  
fuchsi Brend.  
gracilis—*Lophoderus*.  
ovipennis Cas.  
ovithorax Brend.  
pacificus Cas.  
sparsus Lec.  
*Veraphis colon* (Horn).  
impressa (Lec.)

## CORYLOPHIDÆ.

*Ænigmaticus californicus* (undet.)  
*Clypeaster discolor*—*Sacium*.  
scitulus—*Sacium*.  
*Sericoderus flavidus* Lec.

*Sacium amabile* Lec.  
decolor Lec.  
scitulum Lec.

## STAPHYLININA

## CLAVIGERIDÆ.

*Adranes dietzii* Sch.  
pacificus Wick.  
taylori Wick.  
candidum Cas.  
maurinicum Cas.

pacificum Cas.  
politum Cas.  
robustum Cas.  
testaceum Cas.  
*Fusiger californicus* Cas.

## PSELAPHIDÆ.

*Actium bifoveatum* Cas.  
brevipennis Cas.  
californicum—*fuchsi*.  
pluriguttatus Lec.  
*Articerus californicus* Brend.

fuchsi Brend.  
*Batrissodes cicatrosis* (Brend.)  
denticauda (Cas.)  
lustrana Cas.  
mendocino Cas.

- monticola* (Cas.)  
*occidens* (Cas.)  
*pygidialis* (Cas.)  
*speculum* (Cas.)  
*tulareanus* Cas.  
*zephyrinus* (Cas.)  
*Batrisus cicatrosus*—*Batrisoides*.  
*denticauda*—*Batrisoides*.  
*monticola*—*Batrisoides*.  
*occidens*—*Batrisoides*.  
*pygidialis*—*Batrisoides*.  
*zephyrinus*—*Batrisoides*.  
*Biotus formicarius* Cas.  
*Bryaxis albionica* Mots.  
*compar*—*franciscanus*.  
*deformata* Lec.  
*depressifrons* Brend.  
*foveata* Lec.  
*franciscanus* Cas.  
*loripes* Cas.  
*sagax* Lec.  
*subtilis* Lec.  
*Ctenistes pulvureus*—*Sognorus*.  
*Ctenis dispar* Sharp.  
*raffrayi*—*dispar*.  
*Decarthron brendeli* Cas.  
*Euplectus californicus* Cas.  
*orbiceps* Cas.  
*Faronus isabellæ*—*Prosagola*.  
*Morius occidens* Cas.  
*Oropus abbreviatus* Cas.  
*castaneus* Cas.  
*cavicauda* Cas.  
*curvipennis* Cas.  
*debilis* Cas.  
*interruptus* Cas.  
*montanus* Cas.  
*striatus* Lec.  
*testaceus* Cas.  
*Pilopius pulverens* Lec.  
*Prosagola cavifrons* (Cas.)  
*corticina* (Cas.)  
*grandiceps* (Cas.)  
*isabellæ* (Lec.)  
*longicollis* (Cas.)  
*rubida* (Cas.)  
*Pselaptrichus tuberculipalpus* Brend.  
*informis* Cas.  
*nevadensis* Cas.  
*Pselaptus belfragei* Lec.  
*Reichenbachia albionica* Cas.  
*arthritica* Cas.  
*deformata*—*taphrocera*.  
*fallii* Cas.  
*fundata* Cas.  
*depressifrons* Brend.  
*fusticornis* Cas.  
*subtilis* Cas.  
*taphrocera* Cas.  
*tumidicornis* Cas.  
*tumerosa* Cas.  
*turgidicornis* Cas.  
*wickhami* Brend.  
*Rhexidius asperulus* Cas.  
*granulosus* Cas.  
*Sagola cavifrons*—*Prosagola*.  
*corticina*—*Prosagola*.  
*grandiceps*—*Prosagola*.  
*isabellæ*—*Prosagola*.  
*longicollis*—*Prosagola*.  
*rubida*—*Prosagola*.  
*subsimilis* Cas.  
*Scalenarthrus hornii* Lec.  
*Sognorus pulvureus* Lec.  
*Trimium californicum* Lec.  
*Tychus bipuncticeps*—*cognatus*.  
*cognatus* Lec.  
*hexagonus* Cas.  
*puberulus* Lec.  
*puberulus* Lec.  
*sonomæ* Cas.  
*tenellus* Lec.  
*Tyrus corticinus* Cas.  
*Valda frontalis* Cas.

STAPHYLINIDÆ.

- Ababectus pallidiceps* Cas.  
*Acrotona absona* Cas.  
*ardelio* Cas.  
*digesta* Cas.  
*malaca* Cas.  
*servera* Cas.  
*shastanica* Cas.  
*Actobius elegantulus* Horn.  
*formosus* Fall.  
*gratus* Lec.  
*infirmis* Horn.  
*ochreus* Horn.  
*pæderiodes* (Lec.)  
*puncticeps* Horn.  
*semipunctatus* Horn.  
*senilis* Horn.  
*sobrinus* Er.  
*Acutalia elegans* Cas.  
*Acylophorus gilensis*—*pronus*.  
*pronus* Er.



*Adota gnypetoides*—*Atheta*  
*definita*—*Atheta*.  
*insons*—*Atheta*.  
*pavidula*—*Atheta*.  
*scelopacina*—*Atheta*.  
*scorteia*—*Atheta*.  
*subintima*—*Atheta*.

*Aidochara planiventris* Cas.

*Aleochara castaneipennis*—*Baryodma*.  
*puberula* Klug.  
*sulcicollis*—*Eucharina*.  
*tahoensis* Cas.  
*valida*—*Maseochara*.  
*verna*—*Baryodma*.

*Ancæus californicus* (Lec.)

*Ancyrophoma annectens*—*Haploderus*.  
*planus* Lec.

*Anepsiota insignis*—*Atheta*.  
*shastana*—*Atheta*.  
*torpens*—*Atheta*.

*Anthobium atriventre* Cas.

*aurifluum* Fauv.  
*californicum* Fauv.  
*diversicolle* Cas.  
*fraternum* Cas.  
*gilvipenne* Cas.  
*nigerimum* Cas.  
*punctatum* Cas.

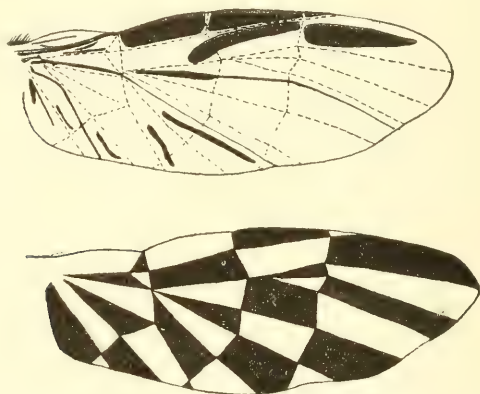


Figure 221. Wing of a Staphylinid beetle.

*Aloconota perditia* Cas.  
*Amanusa angustula* Cas.  
*spissula* Cas.  
*Amischia colonia* Cas.  
*devincta* Cas.  
*Amphicraum alutaceum* Cas.  
*binotatum* Cas.  
*crassicornis* Cas.  
*crassicornis* Cas.  
*flaviscens* Cas.  
*floribundum* Lec.  
*maculatum* Lec.  
*modestum* Cas.  
*opaculum* Fauv.  
*pallidum* Cas.  
*pilosellum* Cas.  
*puberulum* Fauv.  
*scutatum* Fauv.  
*sparsum* Fauv.  
*testaceum* Man.

*subangulatum* Cas.  
*tibiale* Cas.

*Aploderus mimeticus* Fall.  
*princeps* Cas.  
*trinifer* Fall.

*Aploderus annectana*—*Haploderus*.  
*cephalotes*—*Haploderus*.  
*flavipennis*—*Haploderus*.  
*lineolus*—*Haploderus*.

*Apocellus analis* Lec.  
*gracilicornis* Cas.  
*sphaericollis* (Say.)

*Arisota pomonensis* Cas.  
*speculifer* Cas.  
*umbrina* Cas.

*Artochia productifrons* Cas.

*Asemobius cælatus* Cas.

*Atheta alamedana* Cas.  
*aperta* Cas.  
*audens* Cas.

- barbaræ Cas.  
 bicariniceps Cas.  
 blandita Cas.  
 civica Cas.  
 coriaria Kra.  
 definita Cas.  
 dunni Cas.  
 filiola Cas.  
 fugitans Cas.  
 gnypetoides Cas.  
 importuna Cas.  
 informalis Cas.  
 insignis—*Athetota*.  
 insons Cas.  
 intacta Cas.  
 lepidula Cas.  
 loquax Cas.  
 luscitosa Cas.  
 marinica Cas.  
 meticulosa Cas.  
 neutralis Cas.  
 novicia Cas.  
 oraria Kra.  
 oscitans Cas.  
 paganella Cas.  
 pavidula Cas.  
 perpera Cas.  
 perspecta Cas.  
 perversa Cas.  
 picipennis Man.  
 prolata Cas.  
 querula Cas.  
 repaxa Cas.  
 repens Cas.  
 repensa Cas.  
 saturata Cas.  
 scolopacina Cas.  
 scortea Cas.  
 setositarsis Cas.  
 shastana Cas.  
 socors Cas.  
 stoica Cas.  
 subintima Cas.  
 timida Cas.  
 terpens Cas.  
*Athetota insignis* (Cas.)  
*Athetalia bicariniceps*—*Atheta*.  
     *repensa*—*Atheta*.  
*Autalia copiosa* Cas.  
     *elegans* Cas.  
*Bamona falliana* Cas.  
     *tenuissima* Cas.  
*Baptolinus fraternus* Cas.  
     *punctiventris* Cas.  
*Barothnius californicus* (Man.)  
*Bariodma castaneipennis* Esch.  
     *bimaculata* Grau.  
     *denseventris* Cas.  
     *eludens* Cas.  
     *imbricata* Cas.  
     *innocua* Cas.  
     *minuta* Cas.  
     *nitidicollis* Cas.  
     *obsolescens* Cas.  
     *robustula* Cas.  
     *salicola* Cas.  
     *tolerata* Cas.  
     *uvidula* Cas.  
     *verna* Say.  
*Belonchus epippiatus* (Say).  
*Bisnius procerulus* Grav.  
*Blaptolinus fraternus* Cas.  
     *punctiventris* Fall.  
*Bledius apicalis* Fall.  
     *armatus* (Say).  
     *bicolor* Cas.  
     *clarius* Fall.  
     *cribricollis* Lec.  
     *deceptivus* Fall.  
     *diagonalis* Lec.  
     *episcopalis* Fall.  
     *eximius* Cas.  
     *ferratus* Lec.  
     *flavipennis* Lec.  
     *foraminosus* Cas.  
     *forcipatus* Lec.  
     *fratellus* Fall.  
     *gentilis* Cas.  
     *gracillus* Cas.  
     *gradatus* Fall.  
     *jacobinus* Lec.  
     *laticollis* Lec.  
     *lectus* Cas.  
     *luteipennis* Lec.  
     *monstratus* Cas.  
     *monticola* Cas.  
     *nitidiceps* Lec.  
     *opacifrons* Lec.  
     *ornatus* Lec.  
     *parvicollis* Cas.  
     *persimilis* Fall.  
     *piceus* Fall.  
     *plytocinus* Lec.  
     *pleuralis* Lec.  
     *punctatissimus* Lec.  
     *regularis* Fall.  
     *relictus* Fall.  
     *ruficornis* Lec.

- rusticus Fall.  
 specularis Fall.  
 strenuus Cas.  
 tallaci Fall.  
 villosus Cas.  
**Boletobius biserriatus** Man.  
 cingulatus Man.  
 cincticollis Say.  
**Bolitochara californica**—**Stictalia**.  
 nigrina—**Stictalia**.  
**Bratinus californicus** Cas.  
**Bryobiota bicolor** (Cas.)  
**Bryoporus rufescens** Lec.  
**Cafius canescens** Maek.  
 decipiens Lec.  
 dubius (Lec.)  
 femoralis Maek.  
 lithocarinus Horn.  
 luteipennis Horn.  
 opacus Lec.  
 seminitens Horn.  
 sulcicollis (Lec.)  
**Calcdera attenuata** Cas.  
**Calcderna angulata** Cas.  
 brevipennis Cas.  
 continuens Cas.  
 contracta Cas.  
 discolor Cas.  
 exilis Cas.  
 luculenta Cas.  
 mobilis Cas.  
 paliens Cas.  
 peregrina Cas.  
 reducta Cas.  
 rugosa Cas.  
 semibrunnea—rugosa.  
 tentilla Cas.  
**Calochroa rubripennis** Cas.  
**Cileasilphoides** Linn.  
**Colusa brevicornis**—**Echidnoglossa**.  
 erilis—**Echidnoglossa exima**.  
 exima—**Echidnoglossa**.  
 gracilis—**Echidnoglossa**.  
 grandicollis—**Echidnoglossa**.  
 valida—**Echidnoglossa**.  
**Colpodota abdicans** Cas.  
 egens Cas.  
 fatigans Cas.  
 inceptor Cas.  
 laxella Cas.  
 parva Sahl.  
 pupilla Cas.  
 repentina Cas.  
 sonomana Cas.  
 torvula Cas.  
 zephyrina Cas.  
**Conosoma bipustulatum** (Grav.)  
 bisignata—**bipustulatum**.  
 casaneum Horn.  
**Creophilus villosus** (Grav.)  
**Cryptobium californicum** Lec.  
 pacificum—**Hesperobium**.  
 pimerianum—**Gastralobium**.  
 timicum—**Hesperobium**.  
**Dalotia pectorina**—**Dimetrota**.  
**Datomicracoruscula** Cas.  
 insoliata Cas.  
 perpaula Cas.  
 pomonæ Cas.  
**Deleaster concolor** Lec.  
**Diliphrum æquicolle** Cas.  
 occiduum Cas.  
**Delphotia audens**—**Atheta**.  
 fugitans—**Athea**.  
 importuna—**Athea**.  
 intacta—**Atheta**.  
 lepidula—**Aheta**.  
 loquax—**Athea**.  
 novicia—**Atheta**.  
 oscitans—**Atheta**.  
 repaxa—**Atheta**.  
 socors—**Atheta**.  
 stoica—**Atheta**.  
**Dianusa bakeri**—**Emcryptusa**.  
 pasadenæ Cas.  
**Dimetrota cerebrosa** Cas.  
 immerita Cas.  
 incredula Cas.  
 opinata Cas.  
 pectorina Cas.  
 resima Cas.  
 spectator Cas.  
 vacunalis Cas.  
 vigilans Cas.  
**Echidnoglossa æmula** Cas.  
 brevicornis (Cas.)  
 concinna Cas.  
 clavicauda Cas.  
 defecta Cas.  
 eminens Cas.  
 exilis—**eximia**.  
 eximia (Cas.)  
 gaudens Cas.  
 gracilis (Cas.)  
 grandicollis (Cas.)  
 leviventris Cas.  
 ludibunda Cas.  
 strangulans Cas.

- occidua* Cas.  
*quadripennis* Cas.  
*tenuicornis* Cas.  
*valida* (Cas.)  
*ventralis* Cas.  
*Eleusis fascietus* (Lec.)  
*nigrellus* (Lec.)  
*Emplenota arenaria* (Cas.)  
*pacifica* (Cas.)  
*quadrifer* Cas.  
*trilimbata* Cas.  
*Engamota absona*—*Acrotona*.  
*Erochomus punctipennis* Lec.  
*Eucharina cylindrella* Cas.  
*debilicornis* Cas.  
*sulcicollis* (Man.)  
*tibialis* Cas.  
*Eucryptusa bakeri* Cas.  
*fragilis* Cas.  
*Euliusa citrina* Cas.  
*elsinorica* Cas.  
*laticollis* Cas.  
*limatula*—*Gnypeta*.  
*mollis* (Cas.)  
*sparsella* Cas.  
*transversa* Cas.  
*Falagriota asperula* Cas.  
*collaris* Cas.  
*evanescens* Cas.  
*lucida* Cas.  
*occidua* (Cas.)  
*parvipennis* Cas.  
*picina* Cas.  
*Falagria cavipennis*—*Tachyota*.  
*laticollis*—*Euliusa*.  
*læviuscula*—*Lissagria*.  
*occidua*—*Falagriota*.  
*Gænima impedita* Cas.  
*Gastrolobium pimerianum* (Lec.)  
*Geodromicus humboldtearum* Cas.  
*temporalis* Cas.  
*Glyptoma costale* Er.  
*Gnypeta cerebropunctata* (Cas.)  
*curtipennis* Cas.  
*experta* (Cas.)  
*harfordi* (Cas.)  
*impressicornis* Cas.  
*leviventris* Cas.  
*limatula* Cas.  
*linearis* (Cas.)  
*lucens*—*Elius*a.  
*oblata* Cas.  
*sensilis* Cas.  
*Gnypetella laticeps* (Cas.)  
*placidula* Cas.  
*Gyrophypus dimidiatus* (Lec.)  
*hamatus* (Say).  
*infumatus* (Cas.)  
*mollinus* Cas.  
*nanus* (Cas.)  
*picipennis* (Lec.)  
*pusillus* (Cas.)  
*Gyronecha attenuata* Cas.  
*longipennis* Cas.  
*obscura* Cas.  
*Habrocerus tarsalis* Cas.  
*Habrolinus tahoenis* Cas.  
*Hadrotus crassus* Man.  
*villosus*—*Creophilus*.  
*Haploderus annectens* (Lec.)  
*cephalotes* Cas.  
*tiavipennis* (Cas.)  
*linearis* (Lec.)  
*Hemithecta ruficollis*—*Thecturota*.  
*Hesperobium pacificum* (Cas.)  
*tumidum* (Lec.)  
*Hesperolinus angustus* Cas.  
*bicolor* Cas.  
*brunnescens*—*parcus*.  
*parcus* (Lec.)  
*piceus* Cas.  
*pomonæ* Cas.  
*Heterothrops californicus*—*fumigatus*.  
*carbonatus* Fall.  
*fumigatus* Lec.  
*mediocris* Fall.  
*occidentalis* Cas.  
*pusio* Lec.  
*Homalium algarum* Cas.  
*alutaceum* Fauv.  
*ater* Cas.  
*cæsum* Cas.  
*exsculptum* Maek.  
*fractum* Fauv.  
*humile* Maek.  
*lapponicum* Zett.  
*longulum* Maek.  
*megarthroides* Fauv.  
*pacificum* Cas.  
*plagiatum* Man.  
*pusillum* Grav.  
*repandum* Er.  
*rivulare* Payk.  
*rugipenne* Cas.  
*strigipenne* Maek.  
*thevineti* Fauv.  
*Homalota hesperica* Cas.  
*opaca*—*Pontomolata*.

- Homalotusa tahoensis* Cas.  
*Hydromecta benigna* Cas.  
     *callidula* Cas.  
     *jugalis* Cas.  
     *subpollaris* Cas.  
*Illobates californicus* Cas.  
     *nigrinus* Cas.  
*Iotata tepida* Cas.  
     *unica* Cas.  
*Ischnoglossa alticola* Cas.  
*Isoglossa pella* Cas.  
*Isomalus fasciatus*—Eleusis.  
     *nigrellus*—Eleusis.  
*Lathrinæum atrocephalum* Gyll.  
     *nigropiceum* Cas.  
     *pictum* Fauv.  
     *spretum* Cas.  
     *subcostatum* Maek.  
*Lathrobium californicum* Ltc.  
     *franciscanum* Cas.  
     *jacobinum* Lec.  
     *litureum*—*Linolathra*.  
     *puncticeps* Lec.  
*sphæricollis*—*Apocellus*.  
     *subseriatum* Lec.  
*Leptacinodes nigrifolius* (Lec.)  
     *pallidulus* (Lec.)  
*Leptacinus brunneicollis*—*Hesperolin-*  
     *us parvus*.  
     *nigrifolius*—*Leptacinodes*.  
     *pallidulus*—*Leptacinus*.  
     *parvus*—*Hesperolinus*.  
*Leptolinus grandiceps*—*Stictolinus*.  
     *parvus*—*Hesperolinus*.  
*Leptorhinus californicus*—*Scopæus*.  
     *longipennis*—*Scopæus*.  
     *texasus*—*Scopæus*.  
*Lestera fusconigra* (Cas.)  
*Leucopæderus ustus* (Lec.)  
*Leucorhinus luridus* Cas.  
*Linolathra lituraria* (Lec.)  
*Liparocephalus brevipennis* Maek.  
     *cordicollis* Lec.  
*Lispinus californicus* Lec.  
     *linearis* Er.  
*Lithocharis alutacea* Cas.  
     *ochracea* Grav.  
     *quadricollis* Cas.  
*Lomechusa angustata* Fall.  
     *montana* Cas.  
*Maseochara basalis* Cas.  
     *californica*—*valida*.  
     *fustiger* Cas.  
     *insignis* Cas.  
     *puberula* Cas.  
     *valida* (Lec.)  
*Medon consanguinea* Cas.  
     *contigua* Cas.  
     *convergens* Cas.  
     *gregalis* Cas.  
     *languida* Cas.  
     *latiuscula* Cas.  
     *lepida* Cas.  
     *luctuosa* Cas.  
     *malaca* Cas.  
     *mimula* Cas.  
     *puberula* Cas.  
     *retusa* Cas.  
     *sinuaticollis* Cas.  
     *sublesta* Cas.  
*Megarhinus pictus* Cas.  
*Melanalia larvalis* Cas.  
     *tabida* Cas.  
     *tetricula* Cas.  
*Metaxia adjuncta* Cas.  
     *famula* Cas.  
     *fatua* Cas.  
     *subfusca* Cas.  
*Microdota alamedana*—*Atheta*.  
     *perversa*—*Atheta*.  
     *repens*—*Atheta*.  
     *saturata*—*Atheta*.  
*Migarhinus pictus* Cas.  
*Microglossa grandiceps* Cas  
     *suturalia* Man.  
*Microplus costatus* Lec.  
     *punctatus* Lec.  
     *tesserula* Curt.  
*Mycetoporus hospitalis* Fall.  
     *humidis* Cas.  
     *lepidus* Er.  
     *myops* Fall.  
     *neotomæ* Fall.  
*Mymerdonia fauveli* Sharp.  
     *shastanus* Cas.  
     *sonomæ* Cas.  
*Microdota alamedana*—*Atheta*.  
     *perversa*—*Atheta*.  
     *repens*—*Atheta*.  
     *saturata*—*Atheta*.  
*Nemota filiola*—*Atheta*.  
     *informalis*—*Atheta*.  
     *meticulosa*—*Atheta*.  
     *perpera*—*Atheta*.  
     *perspecta*—*Atheta*.  
     *timida*—*Atheta*.  
*Ocalea franciscana* Cas.  
     *grandicollis* Cas.



*Oligopterus cuneicollis* Cas.  
*Oligata pucillima* Cas.  
*Olisthæus megacephalus* Zett.  
*Oligomia perpaula*—*Datomiera*.  
*Oligota oviformis* Cas.  
*Omegalia abjecta* Cas.

*vieta* Cas.  
*Orobanus densus* Cas.  
*rufipes* Cas.  
*simulator* Lec.

*Orus cervicula* Cas.  
*deceptor* Cas.  
*distinctus* Cas.  
*femorata* Fauv.  
*filius* Cas.  
*fraternus* Fall.  
*montanus* Fall.  
*punctatus* Cas.  
*robustulus* Cas.

*Othius californicus*—*Baroethnius*.

*Oxypoda californicus* Cas.  
*cernua* Cas.  
*cruda* Cas.  
*fusiiformis* Cas.  
*insignis*—*Athetota*.  
*modescans* Cas.  
*nimbata* Cas.  
*olescans* Cas.  
*recensa* Cas.

*Oxymedon rubrum* Cas.

*Oxytelus armatus*—*Bledius*.  
*montanus* Grav.  
*niger* Lec.  
*nitidulus* Grav.  
*sculptus* Grav.  
*sobrinus* Lec.  
*vergrandis* Cas.

*Ousipalia hesperica* Cas.  
*pacifica* Cas.

*Pachystilicus quadriceps* (Lec.)

*Pæderillus compotens*—*Pæderus femoralis*.

*Pæderus compotens*—*femoralis*.  
*femoralis* Lec.  
*ustus*—*Leucopæderus*.

*Palaminus lividus* Lec.

*Panalota setositarsælis*—*Atheta*.

*Paradilacra erebea* Cas.

*memnonia* Cas.  
*persola* Cas.  
*sinistra* Cas.  
*subpæqua* Cas.  
*symbolica* Cas.  
*vulgatula* Cas.

*Paramedon pallidipenne* Cas.

*Parothius californicus* Man.

*Phænogyra californica* Cas.

*Philonthus albionicus* Man.

*alumnus* Er.

*alutaceus* Horn.

*bidentatus* Horn.

*bucephalus* Horn.

*californicus*—*fervidus*.

*caurinus* Horn.

*clunalis* Horn.

*crotchi* Horn.

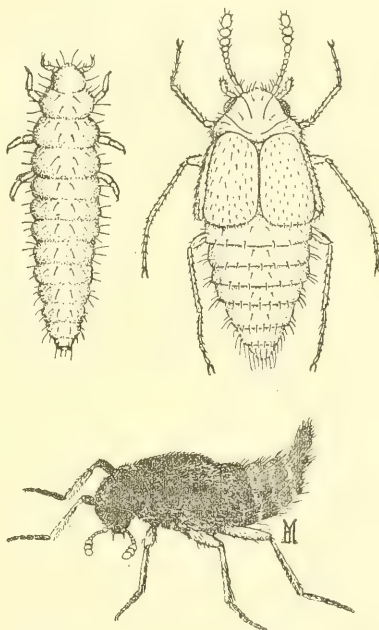


Figure 222. *Oligota oviformis*.

*decipiens* Horn.

*discoidens* Grav.

*dubius*—*Cafius*.

*ferreipennis* Horn.

*fervus* Nord.

*filicornis* Horn.

*flavolimbatus* Er.

*grandicollis* Horn.

*gratus*—*Actobius*.

*hepaticus* Er.

*instabilis* Horn.

*lecontei* Horn.

- longicornis* Steph.  
*nigritulus* Grav.  
*nitescens* Horn.  
*pædaroides*—*Actobius*.  
*petteti* Horn.  
*pivicornis* Horn.  
*picipennis* Maek.  
*politus* Fabr.  
*puberulus* Horn.  
*punctatellus* Horn.  
*quadrulus* Horn.  
*quisquelarius* Gyle.  
*semitruber* Horn.  
*siegwaldi* Man.  
*sordidus* Grav.  
*sulcicollis*—*Cafius*.  
*thermarum* Aube.  
*theveneti* Horn.  
*triangulum* Horn.  
*varians* Payk.  
*varicolor* Bok.  
*ventralis* Grav.  
*versutus* Horn.  
*virilis* Horn.  
*Phlæopora* *adversa* Cas.  
     *jacobiana* Cas.  
     *liberata* Cas.  
*Phlæpterus* *longipalpus* Cas.  
*Phylosis* *bicolor*—*Bryobiota*.  
*Phytosus* *bicolor* Cas.  
     *maritimus* Cas.  
     *opacus* Lec.  
*Pinophilus* *densus* Lec.  
*Platystethus* *americanus* Er.  
*Platyusa* *sonomæ* Cas.  
*Placusa* *petulans* Cas.  
     *striata* Cas.  
     *vaga* Cas.  
*Polystoma* *arenaria*—*Emplenota*.  
     *pacifica*—*Emplenota*.  
*Pontomalota* *californica* Cas.  
     *nigriceps* Cas.  
     *opaca* (Lec.)  
*Protinus* *basalis* Cas.  
     *limbatus* Cas.  
     *maklini* Fauv.  
     *salebrosus* Cas.  
     *sulcatus* Cas.  
*Pseudomedon* *capitulum* (Cas.)  
*Pseudopsis* *detrita* Fall.  
     *minuta* Fall.  
     *obliterata* Lec.  
*Pseudorus* *prolixipennis* Cas.  
*Pseudota* *præsaga* Cas.
- Pyncorus* *armiger* (Fall.)  
*Quedius* *capucinus* (Grav.)  
     *debilis* Horn.  
     *desertus* Horn.  
     *erithrogaster*—*fulgidus*.  
     *lævigatus* (Gill.)  
     *limbifer* Horn.  
     *prostrans* Horn.  
     *seriatus* Horn.  
     *transparens* Mots.  
*Quepisota* *insignis*—*Athetota*.  
*Ramona* *capitulum*—*Pseudomedon*.  
*Rheobioma* *disjuncta* Cas.  
     *terrena* Cas.  
     *marcida* Cas.  
*Rheocharella* *fenyesi* Cas.  
*Sableta* *immunis* Cas.  
*Scopæodera* *nitida* Lec.  
     *sonorica* Cas.  
*Scopæus* *armiger*—*Pyncorus*.  
     *brunnipes* Cas.  
     *californicus* Fall.  
     *longipennis* (Fall.)  
     *punctatus* Cas.  
     *rotundiceps*—*Scopæoma*.  
     *texanus* (Cas.)  
     *truncaticeps*—*Scopæoma*.  
*Scopæoma* *rotundiceps* (Cas.)  
     *truncaticeps* (Cas.)  
*Siagonium* *punctatum* Lec.  
*Silusa* *californica* Barn.  
     *decolorata* Cas.  
     *valens* Cas.  
     *vesperis*—*decolorata*.  
*Sipalia* *frontalis* Cas.  
     *lippa* Cas.  
*Somatium* *oviforme* Cas.  
*Sonomata* *lippa*—*Sipalia*.  
*Stachygraphis* *maculata* Lec.  
*Staphylinus* *capicinus*—*Quedius*.  
     *cinnamopterus* Grav.  
     *ephippiatus*—*Belonchus*.  
*fulgidus*—*Quedius*.  
     *lævigatus*—*Quedius*.  
     *luteipes* Lec.  
     *nigrellus* Horn.  
     *pleuralis* Lec.  
     *raphynus* Lec.  
     *rutilicauda* Horn.  
     *saprinus* Lec.  
     *tarsalis* Lec.  
     *villosus*—*Creophilus*.  
*Stenus* *adelops* Cas.  
     *aveolatus* Cas.

- arizoniæ Cas.  
 californicus Cas.  
 colonus Er.  
 corvus Cas.  
 costalis Cas.  
 dives Cas.  
 ellypticus Cas.  
 exilis Cas.  
 gilliæ Cas.  
 incultus Cas.  
 insignis Cas.  
 lætulus Cas.  
 lucidus Cas.  
 luctuosus Cas.  
 luculentus Cas.  
 pacificus Cas.  
 pinguis Cas.  
 pollens Cas.  
 renifer Lec.  
 sayi Cas.  
 sculptilis Cas.  
 subgriseus Cas.  
 terricola Cas.  
 tristis Cas.  
 vacuus Cas.  
 vestalis Cas.  
 villosus Cas.  
 zunicus Cas.  
 Strictalia aspera Cas.  
 bakeri Cas.  
 brevicornis Cas.  
 californica (Cas.)  
 collaris Cas.  
 laxicornis Cas.  
 minor Cas.  
 nigrina (Cas.)  
 obsolescens Cas.  
 punctiventris Cas.  
 rugipennis Cas.  
 Stilisus occiduus Fall.  
 opaculus Lec.  
 quadriceps—Pachystilicus.  
 Stictolinus œqualis Cas.  
 franciscanus Cas.  
 grandiceps (Lec.)  
 Strigota intrudens Cas.  
 obliquata Cas.  
 placata Cas.  
 seclusa Cas.  
 seducens Cas.  
 Sunius californicus Aust.  
 longiscusculus Man.  
 robustulus Cas.  
 similis Aust.  
 tenuiventris Cas.  
 trinotatus—longiscusculus.  
 trisignatus—longiscusculus.  
 Tachinus agilis Horn.  
 angustatus Horn.  
 debilis Horn.  
 exasperata Cas.  
 faceta Cas.  
 harfordi Cas.  
 instabilis Maek.  
 laticeps Cas.  
 linearis Cas.  
 memnonius Grav.  
 pallipes Grav.  
 semirufus Grav.  
 tachyporoides Horn.  
 Tachyporus bipustulatus—Conosoma.  
 brunneus Fabr.  
 californicus Horn.  
 nitidulus—californicus.  
 Tachyusa arida Cas.  
 cerebropunctata—Gnypeta.  
 experta—Gsnypeta.  
 faceta Cas.  
 harfordi—Gnypeta.  
 laticeps—Gnypetella.  
 linearis—Gnypeta.  
 vespertina Cas.  
 Tanyrhinus singularis Maek.  
 Tarphiota fucicola Maek.  
 hirsutulla Cas.  
 iota Cas.  
 lativentris Cas.  
 litorina Cas.  
 pallidipes (Cas.)  
 Taxicerella immunitas—Sabieta.  
 Terasota perdita—Alconota.  
 Tetrallus bernhaueri Cas.  
 trinitalis Cas.  
 Thiasopila asperata Cas.  
 Thinobius gracilicornis Cas.  
 hesperius Cas.  
 macropterus Lec.  
 oxytelinus Lec.  
 sonomæ Cas.  
 validus Cas.  
 Thinopinus pictus (Lec.)  
 variegatus—pictus.  
 Thinusa maritima Cas.  
 obscura Cas.  
 Thinotus claviceps Cas.  
 Tilia cavicollis—fusconigra.  
 filicornis—fusconigra.  
 fusconigra Mots.  
 rufitarsis—fusconigra.  
 Trachiota cavipennis Cas.

- lativentris* Cas.  
*Trichocanthus pictus*—*Thinopinus*.  
*Trigonurus crotchii* Lec.  
     *edwardsii* Sharp.  
*Trogophilæus armatus* Cas.  
     *bladiinus* Lec.  
     *confinis* Cas.  
     *debilis* Cas.  
     *dentiger* Cas.  
     *diffusus* Cas.  
     *filum* Cas.  
     *gilizæ* Cas.  
     *lathocarinus* Lec.  
     *obliquus* Cas.  
     *occidens* Cas.  
     *pacificus* Cas.  
     *pauperculus* Cas.  
     *prominens* Cas.  
     *sculptilis* Cas.  
     *tantius* Cas.  
*Unamis truncata* Cas.  
*Valenusa parallela* Cas.  
*Vellica longipennis* Cas.  
*Xantholinus cephalus*—*Nudobius*.  
     *diminutus*—*Gyrophypnus*.  
     *hamatus*—*Gyrophypnus*.  
     *nanus*—*Gyrophypnus*.  
     *obscurus* Er.  
     *picipennis*—*Gyrophypnus*.  
     *pusillus*—*Gyrophypnus*.  
*Xanthopygus cacti* Horn.  
*Zalobius serricollis* Lec.  
     *spenicollis* Lec.

## HEMIPTERA.

The Order Hemiptera is the last great group with simple metamorphosis and the first group to deviate from the simple type of mouth structure. The great majority of the species have a metamorphosis as simple as that of the Orthoptera but among scale insects and white flies the nymph is so

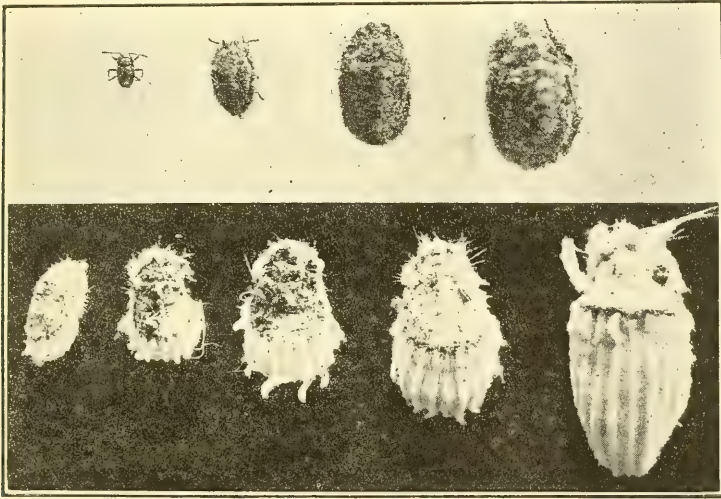


Figure 223. Stages in the growth of the cottony cushion scale.

modified that the change to adult condition seems to be as great as in the higher groups with complex metamorphosis and with an intermediate stage resembling a pupa but which is supposed to differ from a true pupa by



being able to take food. It is quite possible that some of these insects may have a true pupa.

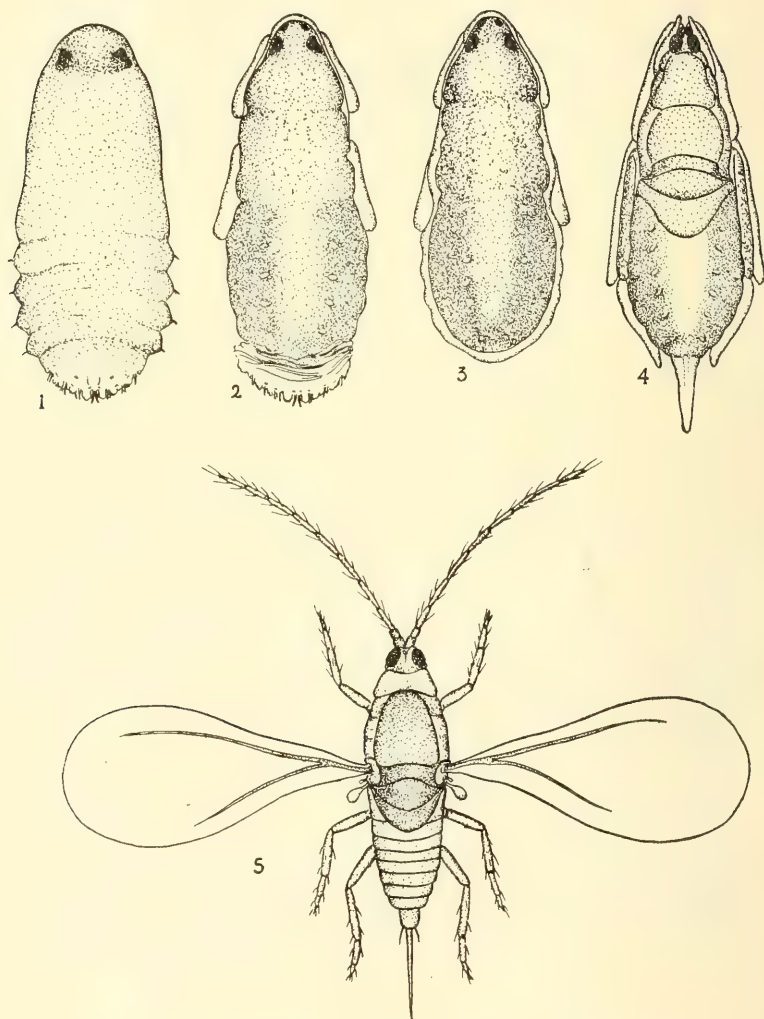


Figure 224. Development of the male of the purple scale.

The mouth parts were modified in this group to enable these insects to feed on the juices of plants and most of them are still plant feeders. The

mandibles and maxillæ have been converted into long hair-like organs, the latter uniting to form a single lancet. All three are enclosed in the enlarged labium. This generally consists of a number of telescopic joints (not exceeding five), which close up as the lancets are thrust into the plant.

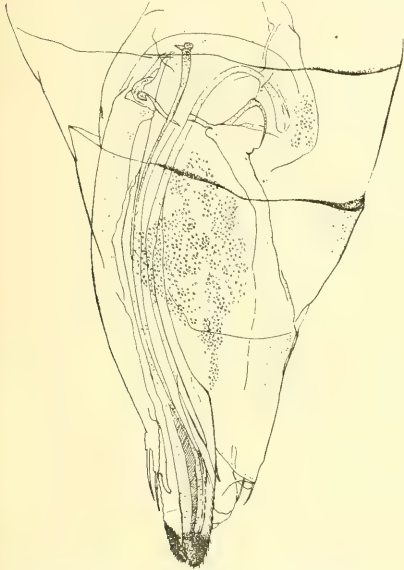


Figure 226. Ovipositor of vine hopper.

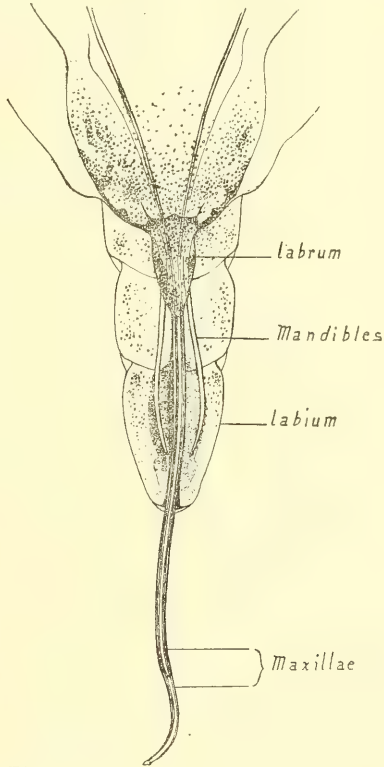


Figure 225. Mouthparts of vine hopper.

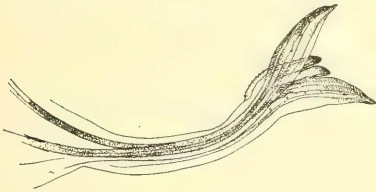


Figure 227. Ovipositor saws.

Economically the Hemiptera are of great importance, especially in an arid climate, because they withdraw the moisture from the plant when it can least afford to lose it. Plant lice and scale insects are the most important families as plant pests.

A number of groups have become predaceous on other insects. Among these certain Reduviids commonly known as kissing bugs can produce a painful bite. The bed bug is a case of one of these insects becoming a human parasite and the lice are even more strictly parasitic.

The classification of Hemiptera consists in the separation first of the thrips often as a distinct order then the lice also sometimes as a distinct order, and the division of the remainder into the Heteroptera and Homoptera, treated by English entomologists as separate orders. The aquatic Heteroptera form a natural group as does the Homopterous series including the scale insects and plant lice.



Figure 229. Section across developing wing of vine hopper.

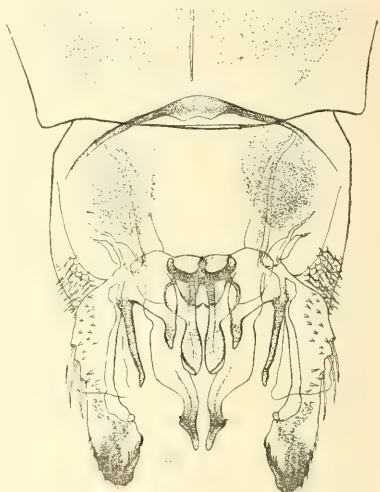
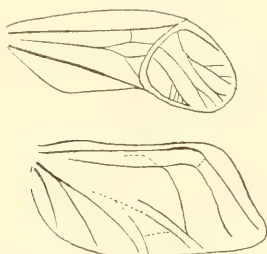


Figure 230. Wings of Heteropterous bug. Figure 228 Male organs of vine hopper.

#### SYNOPSIS OF FAMILIES.

**Coccidæ:** beak apparently from the breast and not jointed. **Aleurodidæ:** hind wings as large as front wings, if wingless with oval supraanal plate.

**Jassidæ:** hind legs enlarged, with rows of spines on tibiæ.

**Aphidæ:** beak apparently from breast. **Psyllidæ:** hind legs enlarged.

**Capsidæ:** wings with two cells beyond thickened portion and no longitudinal veins.

**Lygæidæ:** front legs slender, proboscis and antennæ four-jointed, and only a few longitudinal veins beyond the thickened portion of the wing. **Berytidæ:** body very slender.

**Coreidæ:** similar to Lygæidæ but with longitudinal veins numerous. **Pyrhcoridæ:** no ocelli.

**Pentatomidæ:** scutellum large. **Cydnidæ,** **Corimelænidæ** and **Scutelleridæ:** the first two with front tibiæ spinose and the last two with scutellum broadly rounded behind.

**Membracidæ:** cheeks touching the front coxæ. **Cicadidæ:** three ocelli. **Fulgoridæ:** antennæ beneath the eyes. **Cercopidæ:** pronotum not hiding the scutellum.

**Reduviidæ:** antennæ much larger than head and tarsi three-jointed. **Cimicidæ:** abdomen entirely exposed. **Henicocephalidæ:** the front wings membranous thruout. **Nabidæ:** proboscis three-jointed. **Emesidæ:** and **Phymatidæ:** front legs for grasping, the former with very slender body. **Anthochoridæ:** with an embolium. **Saldidæ:** proboscis reaching to middle coxæ.

**Corisidæ:** hind feet without claws. **Notonectidæ:** head not overlapping prothorax.

**Aradidæ:** similar to Reduviidæ but tarsi two-jointed. **Tingidæ:** wings

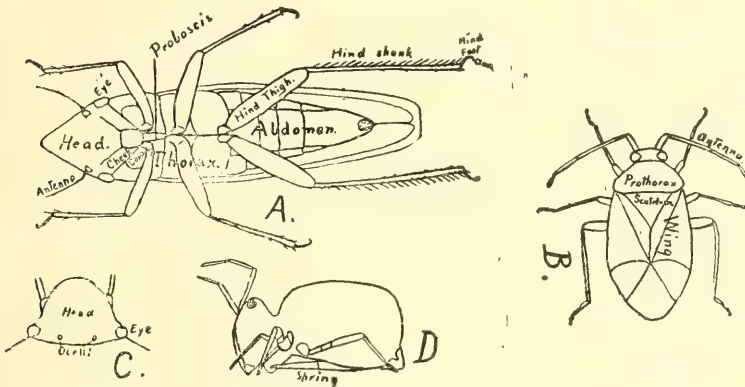


Figure 231. Diagrams showing structure of Hemiptera and Aptera.

longer than abdomen.

**Belostomidæ:** antennæ shorter than head. **Nepidæ:** body slender. **Galgulidæ:** with ocelli. **Nancoridæ:** legs not flattened.

**Thripidæ:** body very small and slender. **Philothripidæ:** without an ovipositor. **Heliothripidæ:** ovipositor curving up.

**Gerridæ:** Legs as long or longer than body. **Veliidæ:** body widest at prothorax.

**Pediculidæ.**

## SCUTELLARINA.

### SCUTELLERIDÆ.

*Aulacostethus similans* Uhl.  
*Camirus porosus* Germ.  
*Cimex torridus*—*Pachycoris*.  
*Eurygaster alternans* Say.  
*Homeomus proteus* Stal.  
*Odontoscelis* Vand.

*Pachycoris fabricii*—*torridus*.  
*porosus*—*Camirus*.  
*torridus* Scop.  
*Tetyra alternans*—*Eurygaster*.  
*Zophoessa porosa*—*Camirus*.

## CORIMELÆNIDÆ.

- Corimelæna anthracina* Uhl.  
*cœrulescens* Stal.  
*ciliatus* Uhl.  
*cyanæus*—*cœrulescens*.
- extensa* Uhl.  
*Thyreocoris cœrulescens*—*Corimelæna*.

## PENTATOMINA.

## PENTATOMIDÆ.

The members of this family feed for the most part on plants but some attack other insects. The harlequin cabbage bug, *Murgantia*, is an important pest.

- Arma spinosa*—*Podisus*.  
*Arvelius albopunctatus* DeG.  
*Brochymena affinis* VanD.  
   *arborea* Say.  
   *obscura* H.S.  
   *quadripustulata*—*Fabr.*  
*Carpocoris lynx* Fabr.  
*Chlorochroa lignata*—*Pentatoma*.  
   *sayi*—*Pentatoma*.  
*Cimex albopunctatus*—*Arvelius*.  
   *custator*—*Thyanta*.  
   *lynx*—*Capocoris*.  
*Cosmopepla conspiciellaris* Dal.  
   *uhleri* Mont.  
*Dendrocoris pini* Mont.  
*Euschistus inflatus* VanD.  
   *conspersus* Uhl.  
   *servus* Say.  
*Eysarcoris conspiciellaris*—*Cosmopepla*.  
   *integressa* Uhl.  
   *punctiger* (undetermined).  
*Halys obscura*—*Brochymena*.  
*Holcostethus abbreviatus* Uhl.  
*Lioderma lignata*—*Pentatoma*.  
   *sayi*—*Pentatoma*.  
*Liotropis contaminatus* Uhl.  
   *humeralis* Uhl.  
   *pini* Mont.  
*Menecles insertus* Say.  
*Murgantia histrionica* Hahn.  
   *munda* Dal.
- Neottiglossa cavifrons* Stal.  
   *undata* Say.  
*Pentatoma claudus*—*Perillus binoculatus*.  
   *faceta* Say.  
   *inserta*—*Menecles*.  
   *lignata* Say.  
   *pallidovirens*—*Thyanea*.  
   *rugulosa*—*Thyanta*.  
   *sayi* Stal.  
   *servus*—*Euschistus*.  
*Perillus binoculatus* Fabr.  
   *claudus*—*binoculatus*.  
   *splendidus* Uhl.  
*Peribilus abbreviatus* Uhl.  
   *limbolarius* Stal.  
*Podisus maculiventris* Say.  
   *pallens* Stal.  
*Prinosoma podopoides* Uhl.  
*Strachia histrionica*—*Murgantia*.  
   *munda*—*Murgantia*.  
*Phytidolomia faceta*—*Pentatoma*.  
*Thyanta antiquensis* Westw.  
   *costa* Stal.  
   *custator* Fabr.  
   *pallidovirens* Stal.  
   *rugulosa* Say.  
   *tæneola* Dal.  
*Trichopepla atricornis* Stal.  
*Ziocona splendidus*—*Perillus*.
- Æthius politus*—*Cydnus*.  
*Cydnus conformis* Uhl.  
   *mirabilis*—*Cyrtomenus*.  
   *obliquus* Uhl.  
   *politus* Sign.  
   *testudinatus* Uhl.
- teter*—*Cyrtomenus*.  
*Cyrtomenus mirabilis* Perty.  
   *mutabilis*—*mirabilis*.  
   *teter* Spin.  
*Geotomus parvulus* Sign.  
*Macroporus repitetus* Uhl.



*Pentatoma cinctus*—*Sehirus*.  
*piceatus* Stal.  
*Sehirus cinctus* Beauv.  
*Trichocoris conformis*—*Cydnus*.

*Microporus obliquus*—*Cydnus*.  
*Melanæthus elongatus*—*Geotomus parvulus*.  
*Pangeus discrepans* Uhl.

## COREINA.

## CAPSIDÆ.

*superbus* Uhl.  
*Camptobrochis nebulosus* Uhl.  
*Capsus caligneus*—*Cyrtocapsus*.  
*media*—*Lepidea*.  
*nubilis*—*Neurocalpus*.  
*rapidus*—*Calocoris*.  
*Catonia cara* Vand.  
*costata* Vand.  
*Cimex pratensis*—*Lygus*.

*Elidiptera fusiformis* Vand.  
*Fulvus anthocoroides* Uhl.  
*Hadromena militaris* Uhl.  
*princeps* Uhl.  
*robusta* Uhl.  
*Irbisia brachycornis* Uhl.  
*pacificus* Uhl.  
*Actinocoris lunatus*—*Largus*.  
*Capsus minus*—*Dysdercus*.  
*Cimex lunatus*—*Largus*.  
*succinctus*—*Largus*.  
*Dysdercus albidiventris* Stal.  
*minus* Say.  
*obliquus* H.S.  
*peruvianus* Guer.  
*Lomatopleura cæsar* Reut.  
*Lopidea cuneata* Vand.  
*marginata* Uhl.  
*media* Say.  
*Lygus annexus* Uhl.  
*pratensis* Linn.  
*sallei* Stal.  
*convexicollis* Reut.  
*vividus* Uhl.  
*Macrotylus angularis* Uhl.  
*regularis* Uhl.  
*tristis* Uhl.  
*verticollis* Uhl.  
*vestitus* Uhl.

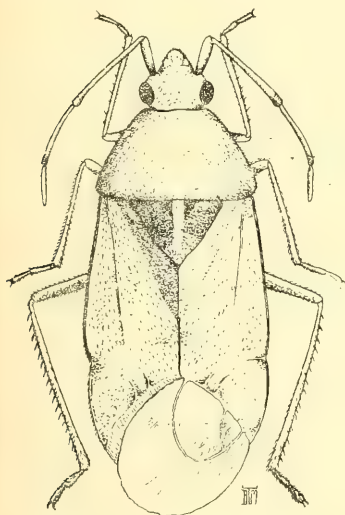


Figure 232. A Capsid.

*Glosterocoris ornatus* Uhl.  
*Compsocorocoris roseus* Uhl.  
*Coquillettia insignis* Uhl.  
*Cyphopelta modesta* Vand.  
*Cyrtocapsis caligneus* Stal.  
*Ceræocoris cerachates* Uhl.  
*Dicyplus californicus* Stal.  
*Eccritotarsus elegans* Uhl.  
*Ectopitocerus anthracinus* Uhl.

*Melinna elongata* Uhl.  
*Neurocalpus nubilis* Say.  
*Oncotylus puberus* Uhl.  
*Orthops scutellatus* Uhl.  
*Phytocoris eximius* Reut.  
*ramosus* Uhl.  
*Pœciloscytus basalis* Reut.  
*intermedius* Uhl.  
*Rhopalostomus brachycoris*—*Irbisia*.  
*Stiphosoma atrata* Uhl.  
*croceipes* Uhl.  
*Systiatiotus venaticus* Uhl.  
*Telcorhinus cyaneus* Uhl.  
 PYRRHOCORIDÆ.  
*Largus cinctus* H.S.  
*convivus* Stal.  
*lunatus* Fabr.

succinctus Linn.  
*Lygæus peruvianus*—*Dysdercus*.  
*Pyrhocoris obliquus*—*Dysdercus*.

*Stenomacra marginella* H.S.  
*Agalliastes decolor* Uhl.  
*Calocoris rapidus* Say.

## BERYTIDÆ.

*Berytus spinosus*—*Jalysus*.  
*Jalysus spinosus* Say.

*Neides gracilipes* Stal.  
*spinosus*—*Jalysus*.

## COREIDÆ.

*Acanthia seratus*—*Harmostes*.  
*Acanthocephala declivis* Say.  
*granulosus* Del.  
*Alydus apicalis*—*Stachylocnemis*.  
*curtulus*—*Tollius*.  
*quinespinosus* Say.  
*tarsatus*—*Hyalymenus*.  
*Anasa obliqua* Uhl.  
*tristis* DeG.  
*Anisocelis corculus*—*Leptoglossa*.  
*zonatus*—*Leptoglossa*.  
*Archimorus lineolata*—*Mozena*.  
*Aufeuus impressicollis* Stal.  
*Ceraleptus americanus* Stal.  
*Cimex tristis*—*Anasa*.  
*Chelinidea vittigera* Uhl.  
*Coreus confluens*—*Sagotylus*.  
*humilis* Uhl.  
*Corizus hyalinus* Uhl.  
*jacatus*—*scutatus*.  
*nigrosternum* Sign.  
*punctiventris* Dal.  
*scutatus* Stal.  
*validus* Uhl.  
*Ficania apicalis* Dal.

*Gonocerus apicalis*—*Ficania*.  
*obliqua*—*Anasa*.  
*Harmostes reflexulus* Say.  
*serratus* Fabr.  
*Jadera hæmatoloma*—H.S.  
*Leptocornis hæmatoloma*—*Jadera*.  
*trivittata*—*Serinetha*.  
*Leptoglossa corcula* Say.  
*zonata* Dal.  
*Lygæus hyalinus*—*Corizus*.  
*trivittata*—*Serinetha*.  
*Margus inconspicuus* H.S.  
*Metapodius granulosus*—*Acanthoceph-*  
*ala*.  
*Mozena lineolata* H.S.  
*Nematopus rufoscutellatus*—*Paryphes*.  
*Paryphes rufoscutellatus* Gray.  
*Rhinuchus declivis*—*Acanthocephala*.  
*Rhopalus scutatus*—*Corizus*.  
*Sagotylus confluentus* Say.  
*Serinetha trivittata* Say.  
*Stachyocnemis apicalis* Dal.  
*Syromastes inconspicuus* H.S.  
*reflexus* Say.  
*Tollius curtulus* Stal.

## LYGÆIDÆ.

*Cistalia signoreti* Guer.  
*Crophius bohemani* Stal.  
*Cymodema tabida* Spin.  
*Cymus bohemani*—*Crophius*.  
*Erenocorus ferus* Say.  
*Erythriscius sandrachatus*—*Oncopelt-*  
*us*.  
*Geocoris pallens* Stal.  
*tristis* Stal.  
*uliginosus* Say.  
*Ischnorhynchus championi* Dist.  
*didymus*—*resedæ*.  
*resedæ* Panz.  
*Lygæosoma solida* Uhl.  
*Lygæus arachatus*—*Oncopeltus*.  
*bicrucis*—*Melanocoryphus*.  
*viloba*—*Pamera*.  
*bistriangularis* Say.

*costalis* H.S.  
*costalis* H.S.  
*faceatus*—*Melanocoryphus*.  
*gutta*—*Oncopeltus*.  
*kalnii* Stal.  
*leucopterus*—*Blissus*.  
*nebulosus*—*Spraglisticus*.  
*reclivatus* Say.  
*reclivatus*—*Oncopeltus*.  
*resedæ*—*Ischnorhynchus*.  
*signoreti*—*Cistalia*.  
*trunculentus* Stal.  
*Megalonotus sodalicus*—*Oncopeltus*.  
*Melanocoryphus bicrucis* Say.  
*faceatus* Say.  
*flavomarginellus*—*bicrucis*.  
*Microtoma atrata* Goeze.  
*carbonaria*—*atrata*.

*Nysius angustatus* Uhl.  
*californicus* Stal.  
*Oncopeltus Gutta* H.S.  
*reclivatus* Fabr.  
*sandrachiatus* Say.  
*Oxycaraeus coriaceipennis*—*Rhyparochromus*.  
*Pamera bilata* Say.  
*Rhyarochromus fallax*—*Spharisticus nebulosus*.  
*Rhyparochromus sodalicus* Uhl.  
*Salda uliginosa*—*Geocoris*.  
*Spragisticus nebulosa* Fall.  
*Trapezonotus nebulosus*—*Spragisticus*.  
*Arphus coriaceipennis* Stal.  
*Blissus leucopterus* Say.  
*Cimex atrata*—*microtoma*.

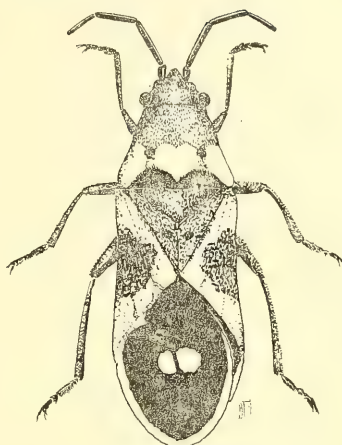


Figure 233. A Lygæid.

*REDUVIINA.*

## ANTHOCHORIDÆ.

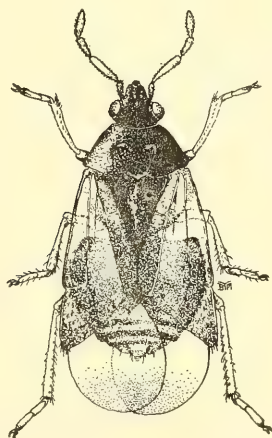
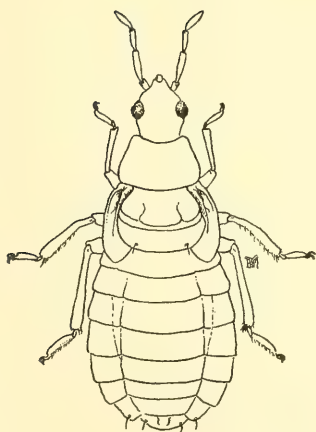


Figure 234. Triphleps

*Anthocoris antevolens* White.  
*whitei* Reut.

*Piezostethus californicus* Reut.  
*Triphleps tristicolor* White.

## NABIDÆ.

*Cimex ferus*—Nabis.  
*Coriscus ferus*—Nabis.

*Nabis ferus* Linn.

## TINGITIDÆ.

*Corythuca cælata* Uhl.  
*fuscigera* Stal.

*Piesma cinerea* Say.

## ARADIDÆ.

*Aradus acutus* Say.  
*affinis*—*lugubris*.  
*ampliatu* Uhl.  
*behrensi* Berg.  
*fuscoannulatus* Stal.

*fuscomaculatus*—*fuscoannulatus*.  
*lugubris* Fal.  
*rachus*—*lugubris*.  
*tuberculifera* Kirby.

## CIMICIDÆ.

*Acanthia lectularis*—*Cimex*.

*Cimex lectularis* Linn.

## HENICOCEPHALIDÆ.

*Hymenocoris formicina* Uhl.

## REDUVIIDÆ.

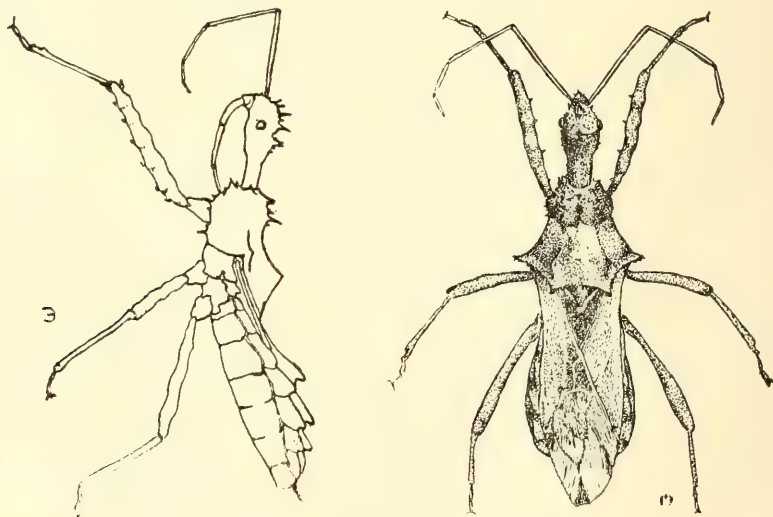


Figure 235. A Reduviid.

The species of *Conorhinus* and its allies are known as kissingbugs for no very good reason. All the members of this family are predaceous.

## SYNOPSIS OF GENERA.

*Conorhinus*: front wings with quadrangular cell in middle of base of mem-

brane. *Polyglampis*: frond wings with a discoidal area. *Sirthenia*, *Rasahus* and *Melanolestes*: thorax constricted after the middle, middle tibiæ of first without spongy spot, front wings of the last black. *Meccus*: body pilose.

*Apiometus*: claws simple.

*Sinea*: mesopleuræ without tubercles or raised folds on hind edge. *Acholla*: front tibiæ without long spines.

*Zelus*, *Milyas*: front femora shorter than hind femora.

*Acholla tabida* Stal.

*Apiomerus crassipes* Fabr.

*flaviventris* H.S.

*repletus* Uhl.

*Ascaræ tablda*—*Acholla*.

*Cimex rubrofasciata*—*Conorhinus*.

*Conorhinus protractus* Uhl.

*rubrofasciatus* DeG.

*variegatus* Drury

*Diplodus luridus*—*Zelus exsanguis*.

*renardii*—*Zelus*.

*Meccus phyllosomus* Burm.

*Melanolestes abdominalis* H.S.

*picipes* H.S.

*Milyas zebra* Stal.

*Petalochirus biguttatus*—*Rasahus*.

*Pirates abdominalis*—*Melanolestes*.

*picipes*—*Melanolestes*.

*Polyglampis pectoralis* Say.

*Rasahus biguttatus* Say.

*Reduvius carinata*—*Sirthenia*.

*crassipes*—*Apiomerus*.

*pectoralis*—*Polyglampis*.

*Sinea complexa* Cand.

*coronata* Stal.

*raptoria* Stal.

*rileyi* Mont.

*undulatus* Uhl.

*Sirthenia carinata* (Fabr.)

*Zelus cervicalis* Stal.

*exsanguis* Stal.

*renardii* Kel.

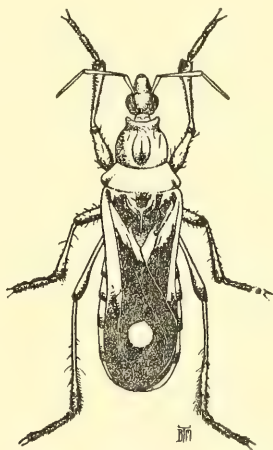


Figure 236. *Rasahus*.

#### SALDIDÆ.

*Salda humilis* Say.

*interstitialis* Say.

*luctuosa* Stal.

*orbiculata* Uhl.

*pallipes* Fabr.

*polita* Uhl.

*sphaceata* Uhl.

*Scanthia humilis*—*Salda*.

*interstitialis*—*Salda*.

*luctuosa*—*Salda*.

*pallipes*—*Salda*.

#### HYDROMETRINA.

##### VELIIDÆ.

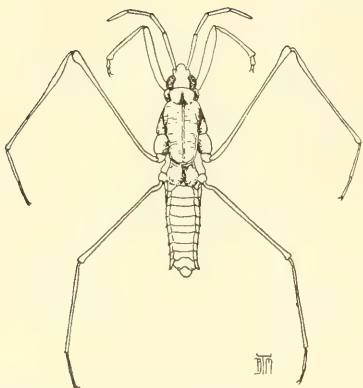
*Hebrus sobrinus* Uhl.

*Macrovelia hornii* Uhl.

*Microvelia americana* Uhl.



## GERRIDÆ.

Figure 237. *Gerris remigis*.

- Aqaurius marginata*—Gerris.  
*remigis*—Gerris.  
*Gerris franciscanus* Stal.  
*arginata* Say.  
*orbona* Stal.  
*remigis* Say.  
*robusta* Uhl.  
*Hygrotrechus remigis*—Gerris.  
*robusta*—Gerris.  
*Limnotrechus marginata*—Gerris.

## NEPINA.

## NEPIDÆ.

*Ranatra quadridentata* Stal.

## GALGULIDÆ.

*Galgulus variegatus* Guer.

*Mononyx badius* H.S.

## CORISIDÆ.

*Corixa abdominalis* Say.  
*bicolor* Uhl.  
*dispersa* Uhl.  
*fossarum* Leach.  
*inscripta* Uhl.

*interruptus* Say.  
*lævigata* Uhl.  
*serrulata* Uhl.  
*wallengreni* Stal.

## NOTONECTIDÆ.

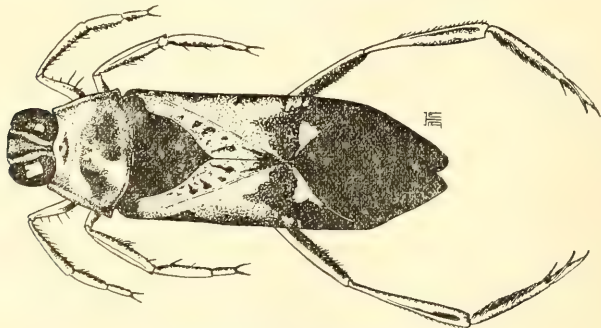


Figure 238. A Notonectid.

*Notonecta insulata* Kirby.  
*shooteri* Uhl.

*Plea striola* Fieb.  
*undulata* Say.

### BELOSTOMIDÆ.

The larger Belostomidæ are commonly known as electric light bugs, being the largest insects commonly found flying about the lights. They live in the water and are predaceous.

### SYNOPSIS OF GENERA.

*Belostoma*: first joint of proboscis short.

*Zaitha*. *Deinostoma*: metasternum with median carina. *Pedinocris*: membranule very short.

*Belostoma annulipes* H.S.  
*dilatatum*—*Deinostoma*.  
*griseum* Say.  
*impressum*—*griseum*.

*Dienostoma dilatatum* (Say.)

*Pedinocris brachonyx* Mayr.

*macronyx* Mayr.  
*Zaitha fusciventris* Duf.  
*indentata*—*stolli*.  
*minor* Duf.  
*stolli* A.&S.

### NAUCORIDÆ.

*Ambrysus pudicus* Stal.

*signoreti* Stal.

## CICADINA.

### CICADIDÆ.

The harvest flies are provided with a very complex musical apparatus on the base of the abdomen of the male.

### SYNOPSIS OF GENERA.

*Tibicen*: head narrower than thorax. *Zammara*: pronotum angularly dilated. *Platypedia*: front edge of the wing bowed as much as hind edge.

*Cicada*.

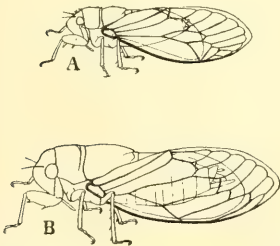


Figure 240. Harvest flies. A. *Platypedia areolata*. B. *Tibicen rimosa*.

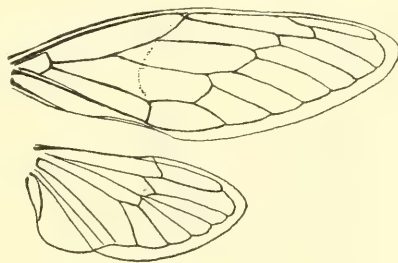


Figure 239. Venation of *Cicada*.

*Cicada ariolata*—*Platypenia*.  
*cinctifera* Uhl.

*hesperia*—*Tibicen*.  
*montezuma* Diet.

rimosa—Tibicen.  
*Platypedia areolata* (Uhl.)  
 minor Uhl.  
*Tibicen blaisdelii* Uhl.

cupreosparsa Uhl.  
 hesperia (Uhl.)  
 rimosa (Say.)  
*Zammara smaragdina* Walk.

## FULGORIDÆ.

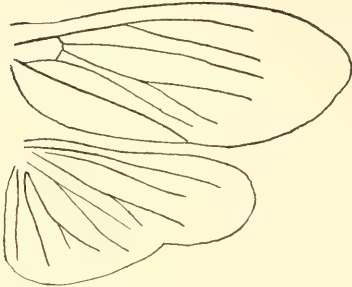


Figure 241. Diagram of the main veins in a Fulgorid wing.

*Cixius cultus* Ball.  
 franciscanus Stal.  
*Liburna consimilis* VanD.  
 occlusa VanD.  
*Megamelus bicolor* Ball.  
*Neæthus vitripennis* Stal.  
*Ollierus aridus* Ball.  
*Orgerius rhyparus* Stal.  
*Scolops abnormis* Ball.  
 pallidus Uhl.  
 viridus Ball.  
*Ticidia cingulata* Uhl.

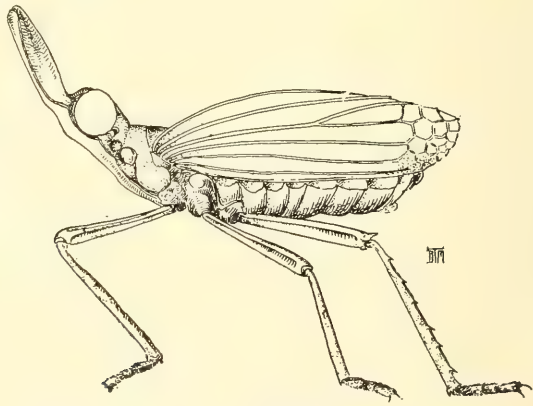


Figure 242. A Fulgorid.

## MEMBRACIDÆ.

*Acutalis binotatus* Godi.  
 occidentalis Godi.  
*Æchmiorpha californiensis* Godi.  
*Antianthe expansa* Germ.  
*Campylenchia curvata* Fabr.  
*Centrodontus atlas* Godi.  
*Centrotis vittata*—*Platycotis*.  
*Ceresa albidosparsa* Stal.  
 bubalus Fabr.  
*Darnis lateralis* Fabr.  
*Gargara atlas*—*Centrodontus*.

*Hemiptycha expansa*—*Antianthe*.  
*Hoplophora tuberculata*—*Platycotis*.  
*Membracis bubalus*—*Ceresa*.  
 curvata—*Campylenchia*.  
 lateralis—*Darnis*.  
 sagitta—*Platycotis*.  
*Platycentris acuticornis* Stal.  
*Platycotis asodalis* Godi.  
 minax Godi.  
 sagittata Germ.  
 tuberculata Fairm.

*vittata* Fabr.  
*Smilia vanduzii* Godi.  
*Stictoccephala franciscana* Stal.  
*Stictopelta nova* Godi.  
*Telemona ccquilletti* Godl.

*mexicana* Stal.  
*reclivata* Godi.  
*rileyi* Godi.  
*Tropidscyta ferruginipennis* Godi.

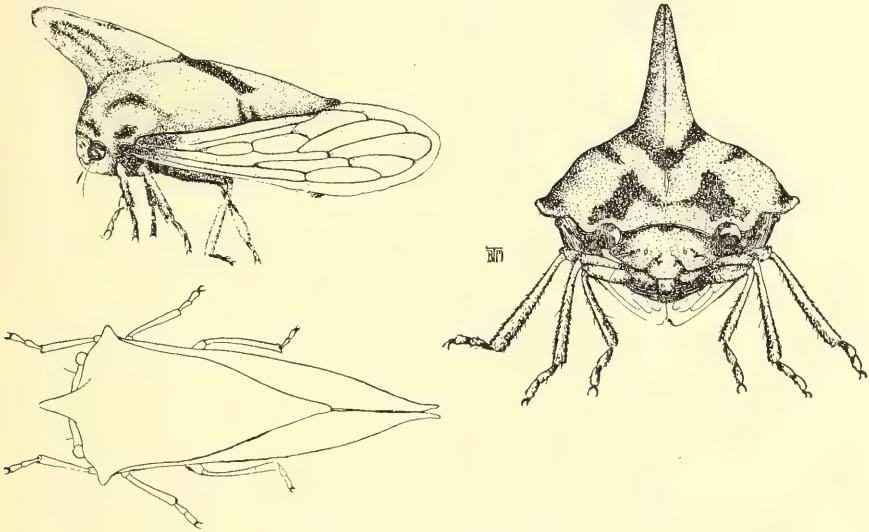


Figure 243. A Membracid.

#### JASSIDÆ.

The Jassidæ are strictly plant feeders but as a rule are not excessively injurious. The vine hopper, *Typhlocyba* comes, is the most injurious vine pest in the state (See California Bulletin 198).

#### SYNOPSIS OF GENERA.

**Thamnotettix:** ocelli on front edge of head which is not sharp, only one cross-vein between primary and independant veins. **Jassus:** without ante-apical cells: **Cicadula:** with anterior fork of primary vein obsolete. **Actinopterus:** without appendix. on front wings. **Scaphoideus:** with outer ante-apical cell narrowed to a point at apex. **Phlepsius** and **Eutettix:** body broad, the former with front wings reticulate with brown.

**Empoasca:** without ocelli. **Typhlocyba:** without marginal vein in hind wing. **Dicraneura:** with two apical cells.

**Platymetopius:** similar to *Thamnotettix* but with two crossveins. **Allygus:** with two supernumerary veinlets in front wing. **Deltotophalus:** front lesse than twice as long as broad.

**Tettigonia:** ocelli on disc of vertex and jugæ not projecting. **Paropulopa:**

body flat. **Pagaronia**, **Bathematophorus** and **Errhomellus**: eyes well back on disk of vertex, the first with elytra longer than abdomen, the last with elytra much shorter. **Dræculacephala**: elytra reticulate at tip. **Diedrocephala**: vertex flat.

**Uhleriella**: front edge of head thin and flat. **Koebelia**: ocelli on face. **Hulera** and **Cochlorinus**: vertex much longer than pronotum, the former with wings much longer than body.

**Agallia**: ocelli on face below edge of vertex. **Pediopsis**, **Macropsis** and **Bythoscopus**: antennæ in feeble cavities, the first with thorax obliquely striate, the second with thoracic margin strongly keeled. **Idiocerus** and **Pachyopsis**: head wider than base of wings, the former with appendage on membrane of wing.

**Homalodisca**: **Oncometopia**: front longitudinally impressed. **Phera**: head somewhat triangular.

**Actinopterus acuminatus** VanD.

**Agallia bigloviae** Bak.

**californica** Bak.

**cinerea** Osb.

**inconspicuus**—**cinerea**.

**lyrata**—**perigrinus**.

**oculata** VanD.

**peregrinus** Stal.

**sanguilenta** (Prov.)

**uhleri** VanD.

**Allygus inscriptus** VanD.

**irreorellus** (Stal.)

**Athysanus irreorellus**—**Allygus**.

**Bathysmatophorus uhleri** Bak.

**sanguilenta**—**Allygus**.

**Bythoscopus peregrinus** Stal.

**Chlorita tessellata**—**Empoasca**.

**Chloroneura abnormis**—**Dicraneura**.

**Cicada flavescens**—**Empoasca**.

**lateralis**—**Oncometopia**.

**sexnotata**—**Cicadula**.

**smaragdula**—**Empoasca**.

**triquetra**—**Homalodisca**.

**Cicadula nigrifrons**—**Deltocephalus**.

**sexnotata** (Fal.)

**Cochlorinus pluto** Uhl.

**Deltocephalus cinerosus** VanD.

**coquilletta**—**Uhleriella**.

**fusconervis**—**nigrifrons**.

**minutus** VanD.

**nigrifrons** Forbes.

**Dicraneura abnormis** Walsh.

**cockerelli** Gil.

**unipuncta** Gil.

**Diedrocephala cythura**—**Versuta**.

**versuta** Say.

**Dræculacephala minor**—**mollipes**.

**mollipes** Say.

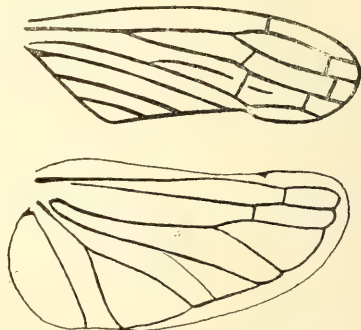


Figure 244. Venation of a Jassid.

**reticulata** Sign.

**Empoasca albinea** Gil.

**flavescens** Fabr.

**robusta** Gil.

**smaragdula** (Fal.)

**tessellata** Fieb.

**Errhomenellus irroratus** Ball.

**Eutettix pannosa** Ball.

**subænea** (VanD.)

**Homalodisca coagulata**—**triquetra**.

**liturata** Ball.

**triquetra** Fabr.

**magnus** Bak.

**robustus** Uhl.

**Hulera quadripunctata** Ball.

**Idiocerus alternans** Fitch.

**amœmus** VanD.

**Jassus acutus**—**Platymetopius**.



- fasciaticollis*—*Thamnotettix*.  
*lactipennis* VanD.  
*Koebelia californica* Bak.  
*Kybos smaragdula*—*Empoasca*.  
*Macropsis atra* Bak.  
*californicus* Bak.  
*humilis* Stal.  
*Oncometopia lateralis* Fabr.  
*Pachyopsis robustus* Uhl.  
*Pagaronia interrupta* Ball.  
*tredecimpunctata* Ball.  
*Paropulopa interrupta* Ball.  
*Pediopsis nubila* VanD.  
*occidentalis* VanD.  
*Phera funebris* (Sign.)  
*vitripennis*—*Homalodisca triquetra*.  
*Phlepsius superbus* VanD.  
*Platymetopius acutus* Say.  
*elegans* VanD.  
*frontalis* VanD.  
*loricatus* VanD.  
*Proconia costalis*—*Oncometopia lateralis*.  
*Scaphoideus imistus* Say.  
*scaleris* VanD.  
*Tettigonia æstuans* Walk.  
*atropunctata* Sign.  
*cethura* Bak  
*circulata*—*atropunctata*.  
*comes*—*Typhlocyba*.  
*funnebris*—*Phera*.  
*gothica* Sign.  
*hieroglyphica* Say.  
*mollipes*—*Dræculacephala*.  
*quadriplagiata* Walk.  
*reticulata*—*Dræculacephala*.  
*Thamnotettix atropunctata* VanD.  
*aureola* VanD.  
*bullata* Ball.  
*capitata* VanD.  
*coquilletti* VanD.  
*fasciaticollis* (Stal.)  
*mendica* Ball.  
*subænea*—*Eutettix*.  
*Typhlocyba coloradensis*—*comes*.  
*comes* Say.



Figure 245. The vine hopper.



Figure 246. Egg of the vine hopper in a leaf.

flavocapitata VanD.  
geminata VanD.  
languida Ball.  
limbata VanD.  
lucida Bak.  
luctuosa Stal.

dentata Gil.  
Uhleriella coquilletti VanD.  
signata Ball.  
stygica Ball.  
Xerophloeæ peltata Uhl.  
viridis Bak.

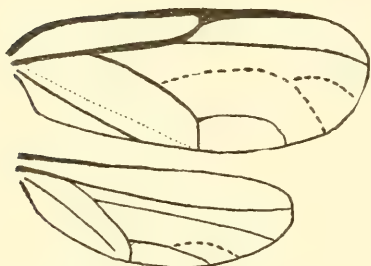
## CERCOPIDÆ.

Aphrophora permutata Uhl.  
Ciastoptera delicata Ball.

obtusa Say.

## APHINA.

## PSYLLIDÆ.



Aphalara pulchella Cfa.

Figure 247. Venation of a Psyllid.

## APHIDÆ.

Plantlice are very important pests, but as a rule quite easy to control by spraying with an oil emulsion or nicotine solution.

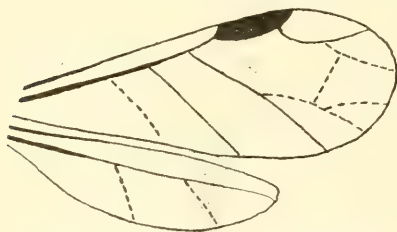


Figure 248. Venation of an Aphid.

Aphis alamedensis Clarke.  
avenæ—Nectarophora.  
betulæcolens—Calypterus.  
brassicæ Linn.  
calendulicola Mon.  
ceanothi Clarke.  
ceanothihirsuti Ess.  
cerasi—Myzus.  
cookii Ess.

cratægi Mon.  
dianthi—Rhopalosiphum.  
gossypi Glo.  
humuli—Phorodon.  
lutescens Ess.  
maidis Fitch.  
mori Clarke.  
œnotheræ Oes.  
persicæniger Sm.  
rosæ—Nectarophora.  
rudbeckiæ Ess.  
sorbi Kalt.

Calaphis caryæ—Callipterus.  
Callipterus arundicolens Clarke.  
betulæcolens Fitch.  
caryæ Mon.  
castaniæ Goetze.  
hyalinus Mon.  
Chaitophorus viminalis Mon.  
Cryptosiphum tahoense Dav.  
Drepanosiphum acerifolii Thom.  
Eriosoma querci—Schizoneura.

- Hyadaphis umbellulariæ* Dav.  
*Hyalopterus arundinis* Fabr.  
*Lachnus alnifoliæ* Fitch.  
     *californicus* Ess.  
*Macrosiphum albifrons* Ess.  
     *lævigatæ* Ess.  
*Myzus cerasi* Fabr.  
*Nectarophora avenæ* Fabr.  
     *baccharidis* Clarke.  
     *californica* Clarke.  
     *citrifolii* Ash.  
     *jasmini* Clarke.  
     *lycopersici* Clarke.  
     *ramni* Clarke.  
     *rosæ* (Linn.)  
     *sonchella* Mon.  
     *valerianiæ* Clarke.  
*Pemphigus betæ* Doane.  
     *fraxinidipetalæ* Ess.  
     *populicaulis* Fitch.  
     *radicola* Es.  
*Phorodon humuli* Fitch.  
     *scrophulariæ* Thom.  
*Phylloxera vastatrix* Pla.  
*Phopalosiphum dianthi* Schr.  
     *violæ* Es.  
*Schizoneura americana* Ril.  
     *lanigera* Haus.  
     *querci* Fitch.  
*Siphocoryne fœniculi* Pas.  
*Siphonophora citrifolii*—*Nectarophora*.

## ALEURODIDÆ.

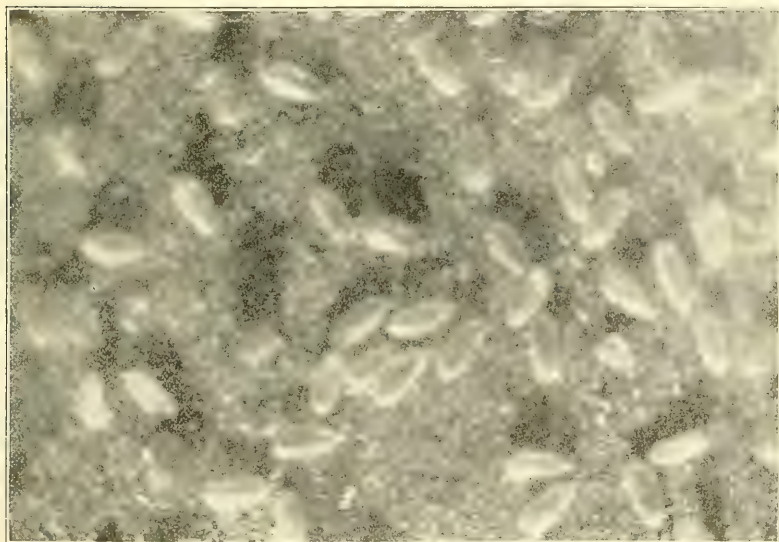


Figure 249. Eggs of the citrus white fly.

The white flies resemble scale insects in the nymph stage but both sexes are winged as adults. The most injurious species is the one attacking citrus trees, *A. citri*, which has only recently established itself in this state. See California Circulars 30 and 32.

*Aleurodes acaciæ* Quain.  
     *amnicola* Bemis.

*citri* R. & H.  
     *coronatus* Quain.

*diasemus* Bemis.  
*errans* Bemis.  
*extraniens* Bemis.  
*kellogg*, Bemis.  
*glacilaris* Bemis.  
*gelatinosa* Coc.

*maskelli* Bemis.  
*perileucus* Coc.  
*hutchingsi* Bemis.  
*inconspicuus* Quain.  
*prumosus* Bemis.  
*quaintancei* Bemis.  
*spiræiodes* Quain.

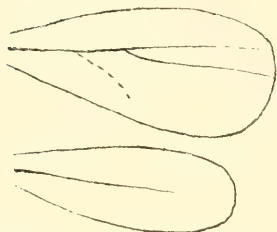


Figure 250. Venation of an Aleurodid.

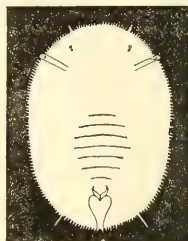


Figure 251. Nymph of the citrus white fly.



Figure 252. The citrus white fly.



Figure 253. Exuvium of the citrus whitefly.

*interrigationis* Bemis.  
*irredescens* Bemis.  
*madroni* Bemis.

*splendens* Bemis.  
*stanfordi* Bemis.  
*tentaculatus* Bemis.



*vittatus* Quain.  
*wellmanæ* Bemis.

*merlini* Bemis

### COCCIDÆ.

This family includes some of the worst insect pests in the state. See California Bulletins 214, 222, 223 and 226.

*Aclerda californica* (Ehr.)  
*tokionis* Coc.  
*Antonia crawii* Coc.  
*Aonidia aurantii*—*Aonidiella*.  
*Aonidiella aurantii* Nash.

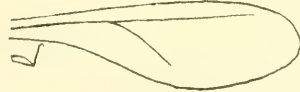


Figure 254. Venation of Coccidæ.

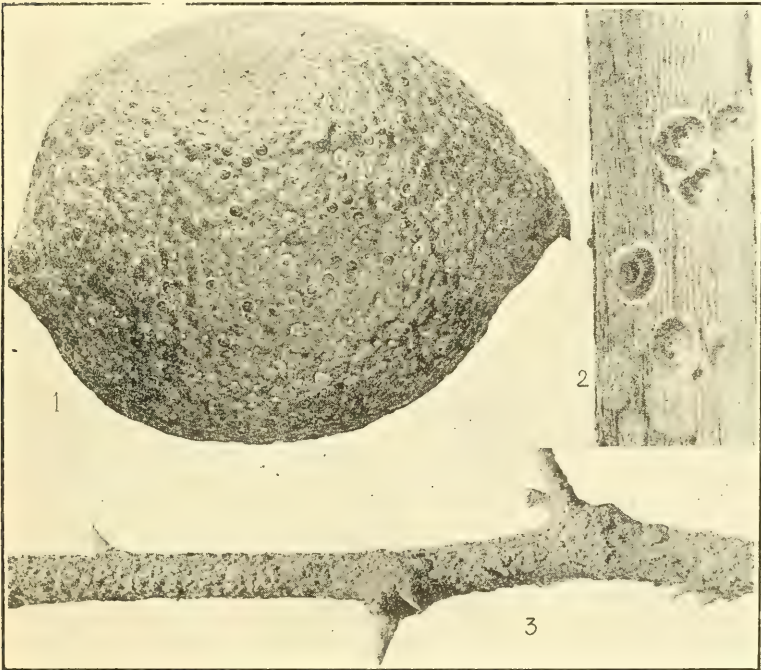
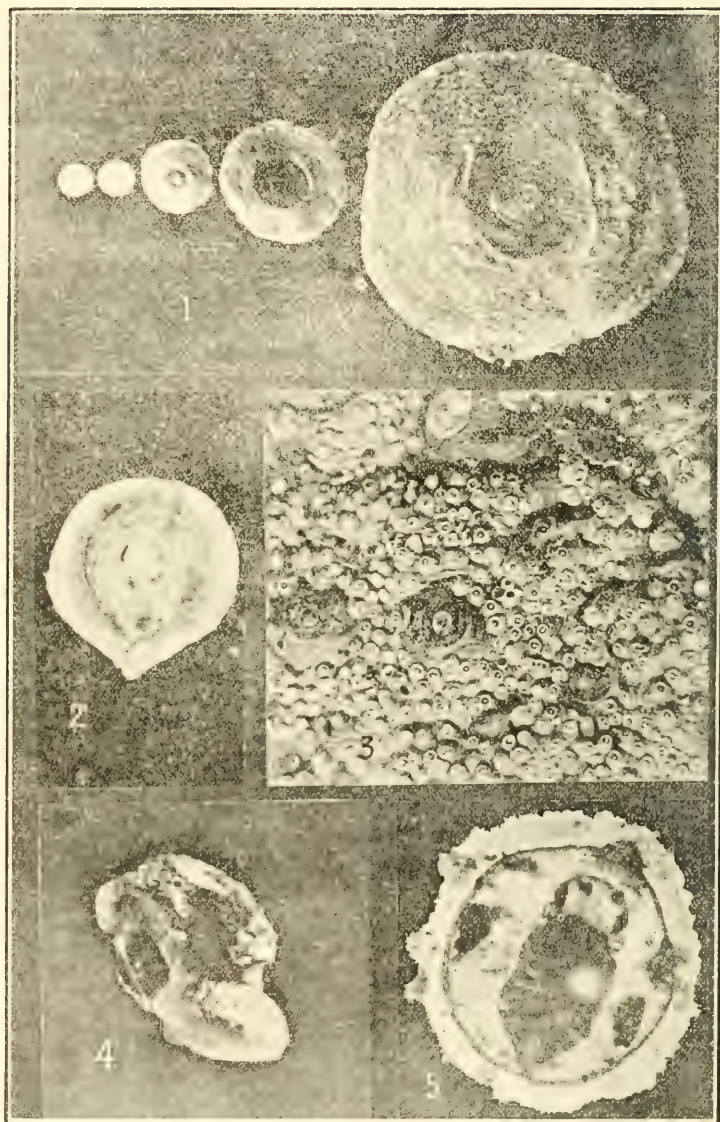


Figure 255. 1. Red scale on lemon. 2. Red scale on nightshade. 3. Red scale on twig of lemon.

Figure 256. 1 Different stages in formation of scale covering. 2 The ventral scale formed beneath the insect. 3 Old and young red scales on orange. 4 Larva of parasite, *Aphelinus diaspidis*, feeding on Red scale; the scale shriveled from absorption of body contents. 5 Yellow scale containing pupa of parasite *Aspidiotiphagus citrinus*. (Opposite page)





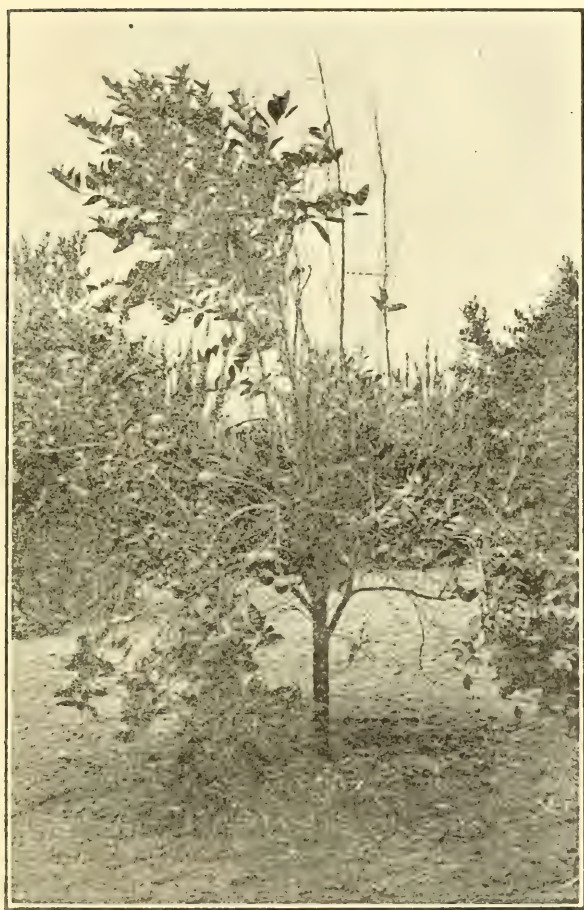


Figure 257. Tree partially killed by Red Scale.

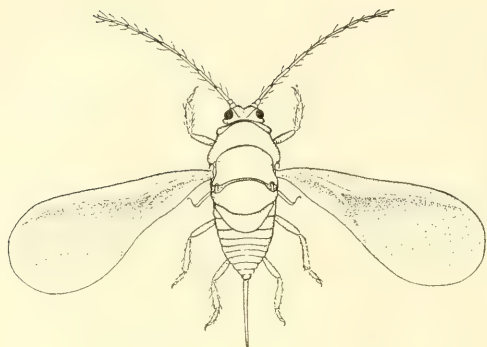


Figure 258. Male of Red scale.

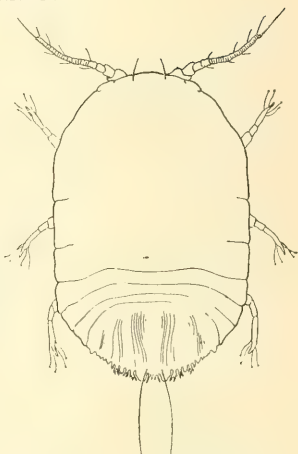


Figure 259. Motile young of Red scale.

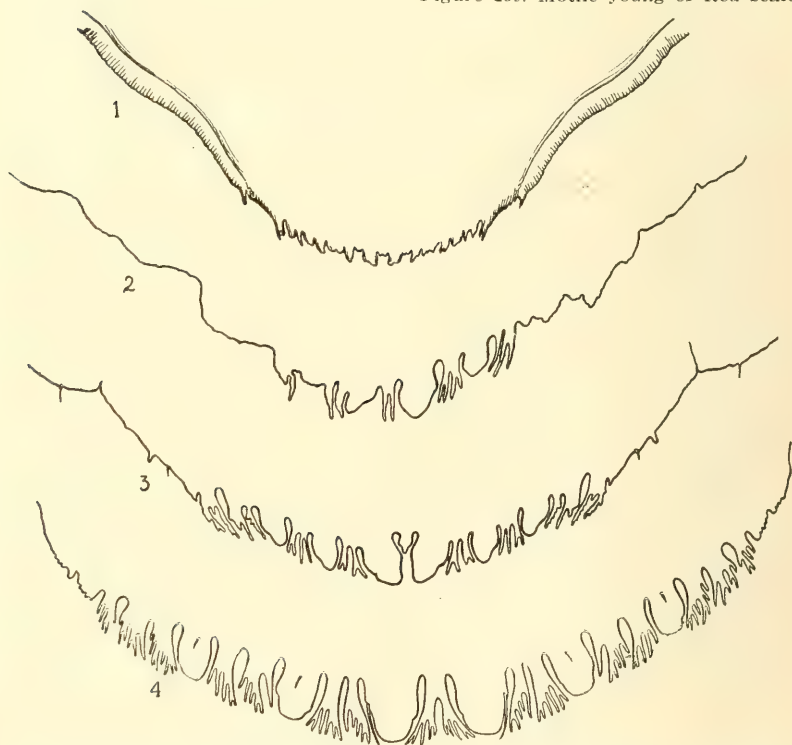


Figure 260. 1 A cast skin after first molt. 2 A ventral cast skin, second molt. 3 Dorsal cast skin, second molt, same in Figure 265 b., which shows the ventral cast skin. 4 Characters of complete insect.

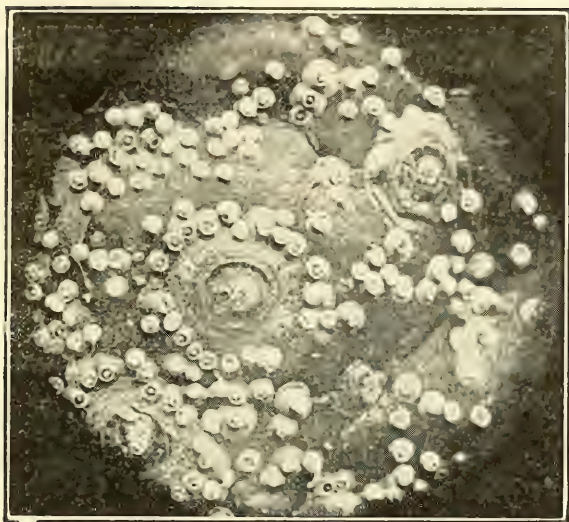


Figure 261 Red scale, mature females and young.

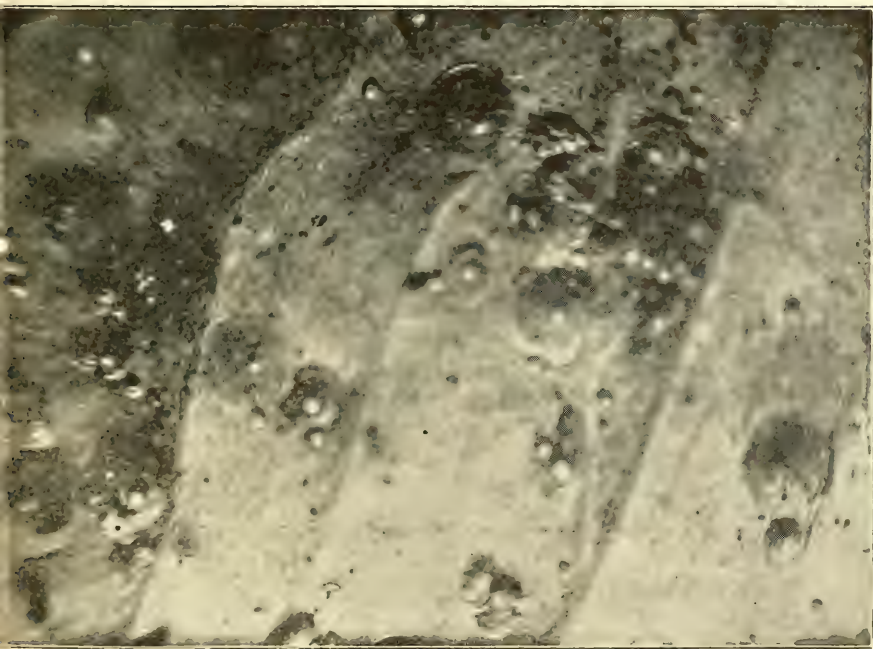


Figure 262 Red scale on leaf.



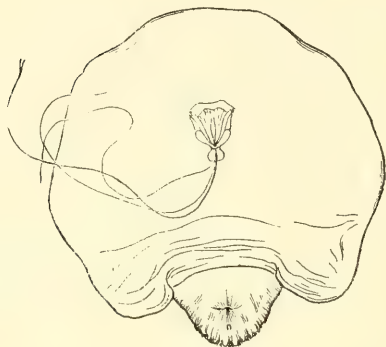


Figure 263. Ventral view of Red scale.

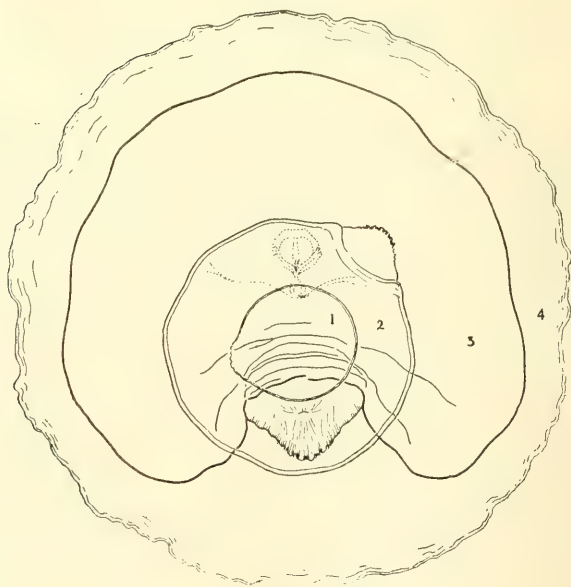


Figure 264 Showing the mature Red scale with its cast skins and scale covering.  
1 First cast skin. 2 Second cast skin. 3 The insect itself. 4 The scale covering.



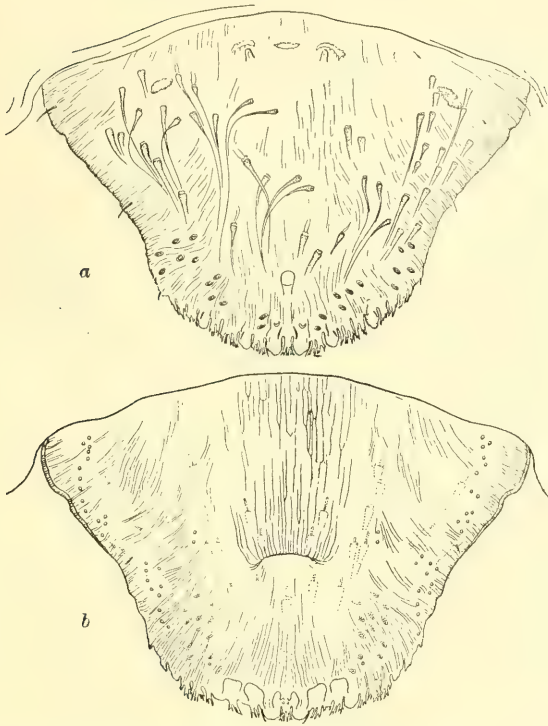


Figure 265. a. Dorsal view of pygidium of Red scale, b. Ventral cast skin of Red scale. From same insect as Figure 260, 3, which is the borsad cast skin.

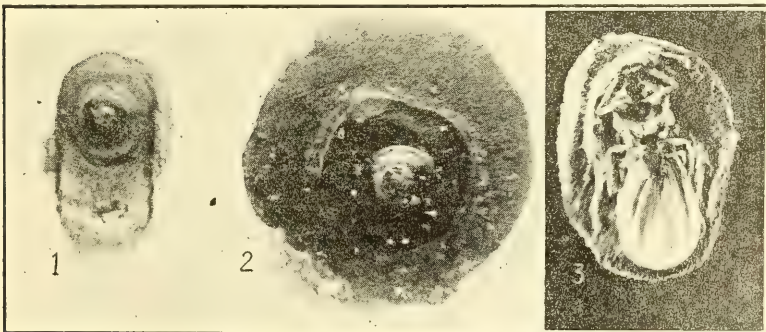


Figure 266. Scale of male. 1 Scale of female, same magnification. 3 Inverted male scale, showing winged insect beneath.

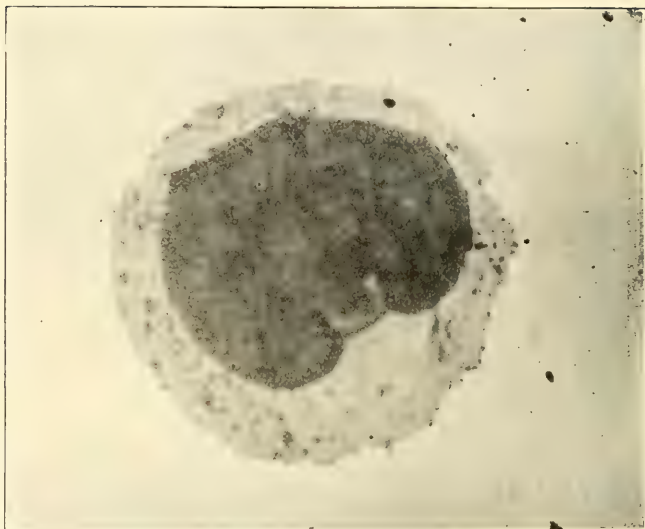


Figure 267. Red scale, the insect showing thru the transparent scale.

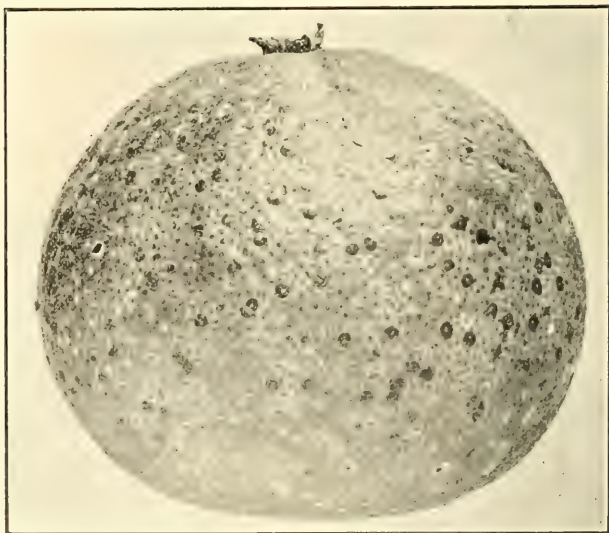


Figure 268 Yellow scale, *Chrysomphalus aurantii* on orange.

- Aspidiotus abietus* (Schr.)  
*æsculi* John.  
*albus*—*juglansregiæ*.  
*albopunctatus*—*perniciosus*.  
*californicus* Col.  
*camelliærapax*.  
*citrinus*—*Aonidiella aurantii*.  
*conshiformis*—*Lepidosaphes ulmi*.  
*coniferarum* Coc.  
*ancylus* Putn.  
*andromelas*—*perniciosus*.  
*aurantii*—*Aonidiella*.  
*bambusarum*—*Odontaspis*.  
*bigeloviae*—*Targionia*.  
*buxi*—*Pinnaspis*.  
*convexus*—*rapax*.  
*dearnessi*—*Targionia*.  
*densifloriæ* Brem.  
*dictyospermi*—*Chrysomphalis*.  
*duplax*—*Pseudaonidia pæoniæ*.  
*echinocaeti*—*Diaspis*.  
*ehrhorni* Col.  
*florenciæ* Col.  
*furfurus*—*Chionaspis*.  
*hederæ* (Vall.)



Figure 269. Oleander scale *Aspidiotus hederæ*.

*juglansregiæ* Coms.  
*ostreæformis* Curt.  
*prosopidis*—*Xerophilaspis*.

*rapax* Coms.  
*pæoniæ*—*Pseudaonidia*.  
*perniciosus* Coms.

pinifoliæ—*Chionaspis*.  
 piricola—*Epidiaspis*.  
 rosæ—*Aulacaspis*.  
 rossi—*Chrysomphalis*.  
 salacisnigræ—*Chionaspis*.  
 shastæ—*coniferum*.  
 tenebricosus—*Chrysomphalus*.

cistudiformis Coms.  
 floridensis Coms.  
 irregularis Coc.  
 irregularis Coc.  
 rubens Mask.  
*Georputo ambigua* Full.  
 bahiæ (Ehr.)

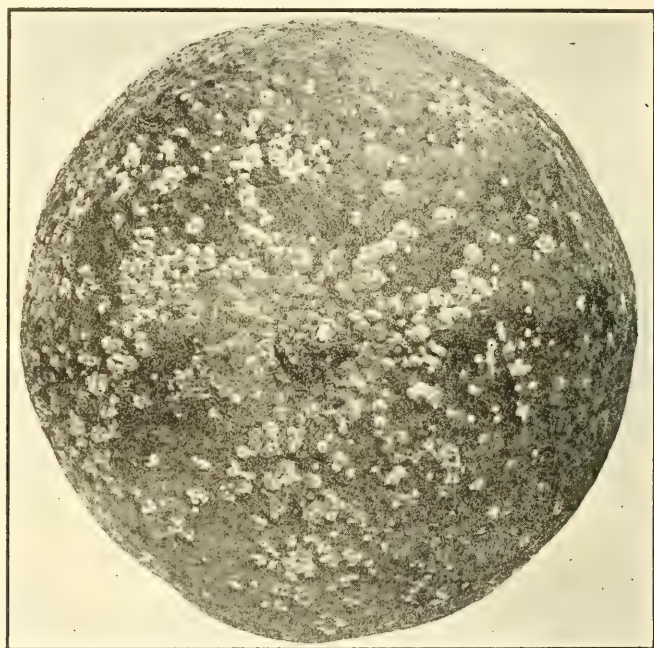


Figure 270. Orange infested with Greedy scale *Aspidiotus rapax*.

yulupæ Brem.  
*Asterolecanium crawii* (Coc.)  
 pentagona (Targ.)  
 rosæ (Bouche.)  
 variolosum (Ratz.)  
*Asterolecanium variolosum* Ratz.  
*Aulacaspis crawii* (Coc.)  
*Blastothrix yuccæ*—*Ceroputo*.  
*Cerococcus ehrhorni* Coc.  
 quercus Coms.  
*Ceroplastes ceriferus* (And.)  
 cerripediformis Coms.

cænothi—*yuccæ*.  
 yuccæ (Coc.)  
*Chætococcus bambusæ* (Mask.)  
*Chermes hederæ*—*Aspidiotus*.  
 oleæ—*Saisettia*.  
*Chionaspis aspidistræ*—*Hemichionaspis*.  
 assimilis Mask.  
 aucubæ—*Phenacaspis*.  
 biclavis—Howardia.  
 citri Coms.  
 chinensis—*Phenacaspis*.



cockerelli—*Phenacaspis*.  
 difficilis *Coc*.  
 euonymi *Coms*.  
 furfura (*Fitch*).  
 latissima—*Phenacaspis*.  
 ortholobis *Coms*.  
 pinifoliae (*Fitch*).  
 quercus *Coms*.  
 salacis nigrae *Walsh*.  
 sassceri *C. & R*.  
 spartinæ *Coms*.  
 striata *News*.  
 wisteriæ *Cool*.  
 persicæ—*Lecanium*.  
 pollini—*Pollinia*.

aurantii—*Aonidiella*.  
 citrinus—*Aonidiella aurantii*.  
 dictiospermi (*Morg*).  
 rossi (*Mask*).  
 tenebricosus (*Coms*).

*Coccus* abietus—*Aspidiotus*.  
 adonidum—*Pseudococcus*.  
 aonidum—*Chrysomphalus*.  
 beckii—*Lepidosaphes*.  
 blanchardii—*Orthesia*.  
 bromelhae—*Diaspis*.  
 ceriferus—*Ceroplastes*.  
 crawii—*Pseudococcus*.  
 cupressi—*Pseudococcus*.  
 destructor—*Pseudococcus cacti*.

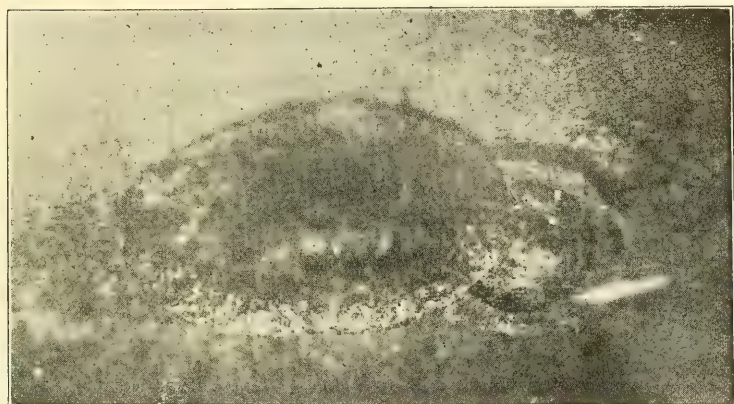


Figure 271. Red and soft brown scale.

stellifera—*Vinsonia*.  
 ulmi *Lepidosaphes*.  
 variolosum—*Asterolecanium*.  
 ulmi—*Lepidosaphes*.  
 vitis—*Pulvinaria*.  
 ziziphus—*Parlatoria*.  
*Cenchaspis angæci Coc*.  
 hibisci—*angæci*.  
*Dactylopius affinis*—*Pseudococcus*.  
 andersoni—*Pseudococcus*.  
 aurilanatus—*Pseudococcus*.  
 azaleæ—*Pseudococcus*.  
 calceolaria—*Pseudococcus*.  
 citri—*Pseudococcus*.  
 coccus *Costa*.  
*Chrysomphalus aonidum* (*Linn*.)

dudlei—*Pseudococcus*.  
 ephedra—*Pseudococcus*.  
 erigoni—*Erium*.  
 gloveri—*Lepidosaphes*.  
 hesperidum *Linn*.  
 hymenocleæ—*Pseudococcus*.  
 icteryoides—*Pseudococcus*.  
 lichtensioides—*Erium*.  
 longispinus—*Pseudococcus adonidum*.  
 maritimus—*Pseudococcus*.  
 pseudonipæ—*Pseudococcus*.  
 quercus—*Pseudococcus*.  
 ryani—*Pseudococcus*.  
 salinas—*Pseudococcus*.  
 sequoiæ—*Pseudococcus*.





Figure 272. Soft brown scale on orange twig.

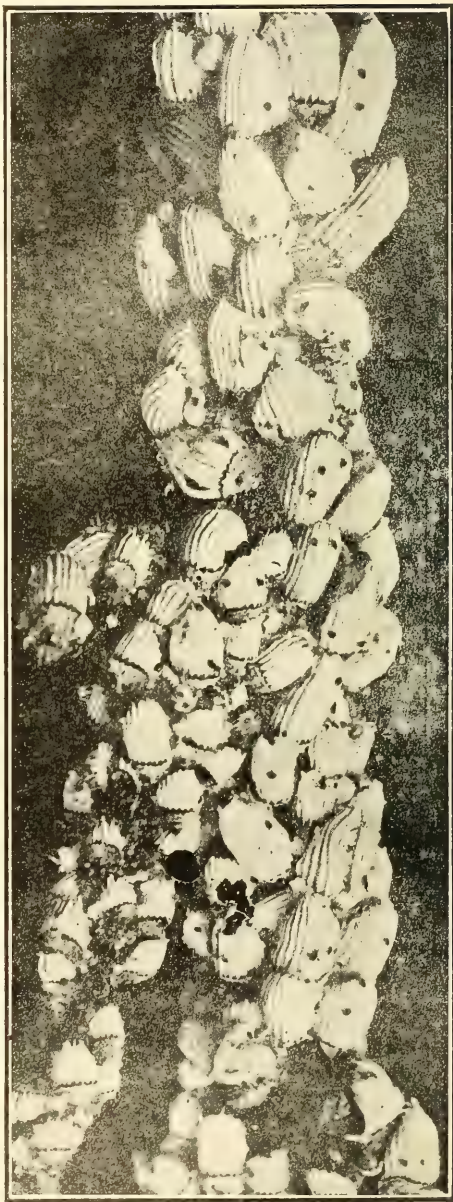


Figure 273. Cottony cushion scale on orange twig.

solani—*Pseudococcus*.  
*Diaspis boisduvalii* Sign.  
 bromeliæ (Kern.)  
 cacti—*echinocacti*.  
 carulei Targ.  
 cattleyæ—(Coc.)  
 crawii—*Aulacaspis*.  
 echinocacti (Bouche.)  
 fiorinæ—*Fiorinia*.  
 pentagona—*Aulacaspis*.  
 rosæ—*Aulacaspis*.  
*Dorthesia citri*—*Pseudococcus*.  
*Epidiaspis pyricola* (Del.)  
*Eriococcus adenostomæ* Ehr.  
 artemisiæ Kuw.  
 auricariæ Mask.  
 bahiæ Ehr.  
 catalinæ Ehr.  
 howardii Ehr.  
 neglectus Coc.  
 palmeri Coc.  
*Erium erigoni* (Ehr.)  
 lichtensioides (Coc.)  
*Eucalymnatus perforatus*—*tessellatus*.  
*tessellatus* (Sign.)  
*Eulecanium adenostomæ*—*Lecanium*.  
 armeniacum—*Lecanium corni*.  
 cerasorum (Coc.)  
 crawii—*Lecanium corni*.

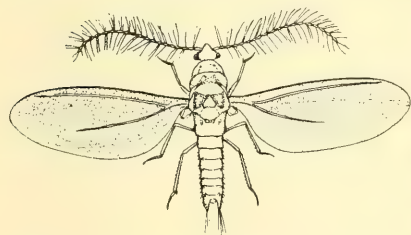


Figure 275. Male of Cottony cushion scale.

kermoides—*Lecanium* *quercifex*.  
 magnoliarum—*Lecanium persicæ*.  
 persicæ—*Lecanium*.  
 pruinatum—*Lecanium*.  
 pubescens—*Lecanium*.  
 quercitrionis—*Lecanium quercifex*.

*Exærotopus caricis* Ehr.  
*Fiorina fiorinæ* (Targ.)  
*Gossyparia spuria* (Mod.)  
*Hemichionaspis aspidistræ* Sign.  
*Howardia biclavus* (Coms.)  
*Icerya purchasi* Mask.

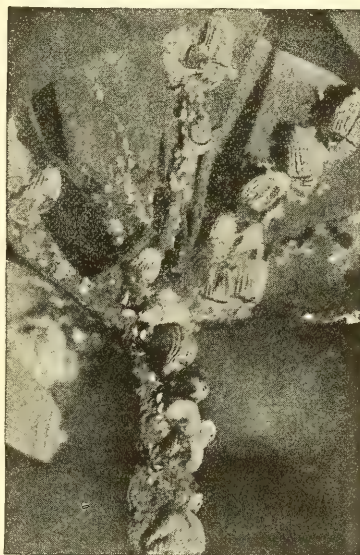


Figure 274. The cottony cushion scale.

*Ischnaspis longirostris* (Sign.)  
*Kermes austini* Ehr.  
 cockerelli Ehr.  
 galliformis Ril.  
 nigropunctatus E.&C.  
 rattani Ehr.  
*Lecaniodiaspis pubescens* Ehr.  
 rufescens (Coq.)  
*Lecanium adenostomæ* Kuw.  
 areniacum—*corni*.  
 cerasorum—*Eulecanium*.

*corni* Bouche.  
 crawii—*corni*.  
 hemisphericum—*Saissetia*.  
 persicæ Fabr.  
 pruinatum Coq.  
 pubescens Ehr.  
 quercifex Fitch.  
 quercitrionis—*quercifex*.  
 tessellatus—*Eucalymnatus*.  
*Lepidosaphes beckii* (Newm.)







Figure 277. Purple scale on orange leaf enlarged.



Figure 278. Purple scale on orange leaf

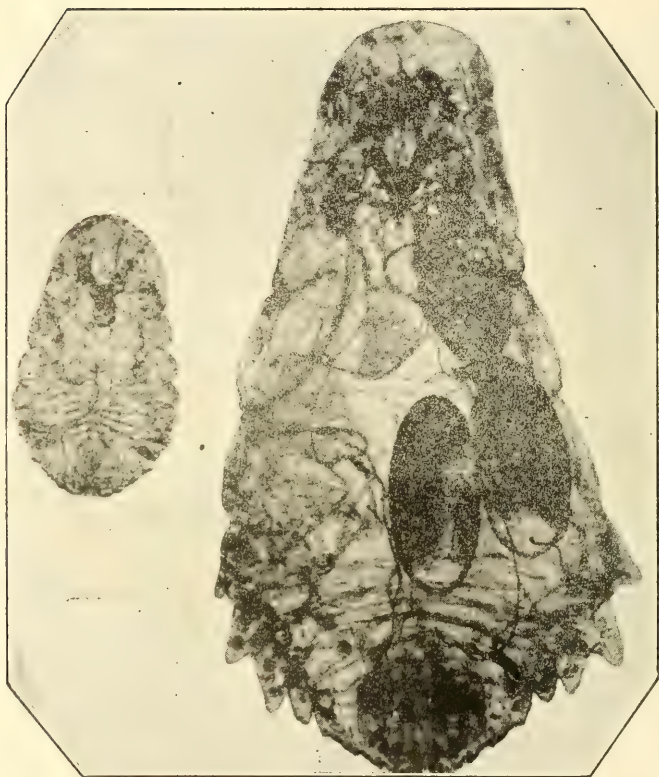


Figure 279. Purple scale after first molt, and mature female.



Figure 280. Pygidium of adult female Purple scale.



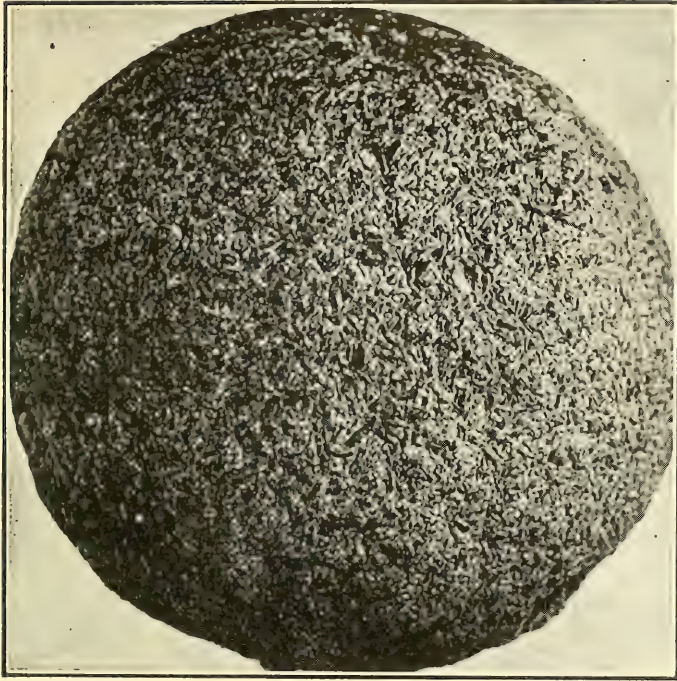


Figure 281 Orange incrustated with Purp'e scale.



Figure 283. First cast skin of purple scale; ventral view showing how skin is split and ventral portion with legs and moth parts pushed back



Figure 282. Active larva of purple scale.

concolor (Coc.)  
 gloveri (, ack.  
 newsteadi—(Sulc.)  
 ulmi. (Linn.)  
**Leucaspis cupressi** Col.  
 japonicus Coc.  
 kellogi Col.  
**Mytilaspis beckii**—**Lepidosaphes**.  
 concolor—**Lepidosaphes**.  
 longirostris—**Ischnaspis**.  
 newsteadi—**Lepidosaphes**.  
 pomorum—**Lepidosaphes ulmi**.  
 ulmi—**Lepidosaphes**.  
**Nidularia californica**—**Aclerda**.  
**Odontaspis bambusarum** Coc.  
 graminis Brem.  
**Orthesia californica** Ehr.  
 insignis Doug.  
**Palæococcus bridwelli** Col.  
**Parlatoria blanchardi** (Targ.)  
 pergandii Coc.  
 victrix—**blanchardii**.  
 ziziphus Lucas.  
**Phænacoccus artemisiæ** Ehr.  
 bahiæ—**Ceroputo**.  
 colmani Ehr.  
 kuwanæ Col.  
 ramonæ Ess.  
 simplex King.  
 stachylos Ehr.  
**Phænacaspis artemisiæ** Ehr.  
 aucubæ (Cool.)

chinensis Coc.  
 cockerelli (Cool.)  
 latissima (Coc.)  
**Phenicoccus marlatii** Coc.  
**Physokermes concolor** Col.  
 insignicola Craw.



Figure 284. Pine scale, *Physokermes insignicola*.

**taxifolia** Col.  
**Pinnaspis buxi** (Bouche.)  
**Pollinia pollini** (Costa.)  
**Prosopophora rufescens**—**Lecaniodias-**  
**pis**.  
**pæoniæ** (Coc.)

**Pseudococcus**. 1813. **citri**. 1869. **longispinis** anal appendages as long as body. 1889. **crawii**: **citri**—antennal joint 2 longer than 7. **ryani**: **crawii**—antennal joint 1 longer than 5. **aurilanus**: band of yellow wax on back. 1890. **ephedræ**: **crawii**—fifth antennal joint four times as long as broad. 1891. **iceryoides**: with dense ventral cottony cushion. 1898. **azalæ**: **crawii**—posterior lateral filaments nearly as long as anal. 1900. **quercus**: **crawii**—body greenish brown. **maritimus**: **crawii** et al anal filaments half as long as body. 1901. **sequoiæ**: **citri**—antennal joint 4 as long as 6. 1902. **salinas**: **crawii**—cephalic filaments present. 1903. **dudlei**: **crawii** et al—antennal joint 1 longer than 3. **andersonni**: **crawii** et al—antennal joint 2 longer than 4.

**Pseudaonidia adonidum** (Linn.)  
 affinis (Mask.)  
 agrifoliæ Es.  
 andersoni (Col.)  
 artemisiæ Es.

**aurilanus** (Mask.)  
 azaliæ (Tin.)  
 calceolariæ (Mask.)  
 citri (Risso.)



Figure 285. Citrus mealy bug *Pseudococcus citri*. The two figures on the right show the development of the cottony mass in which the eggs are deposited.

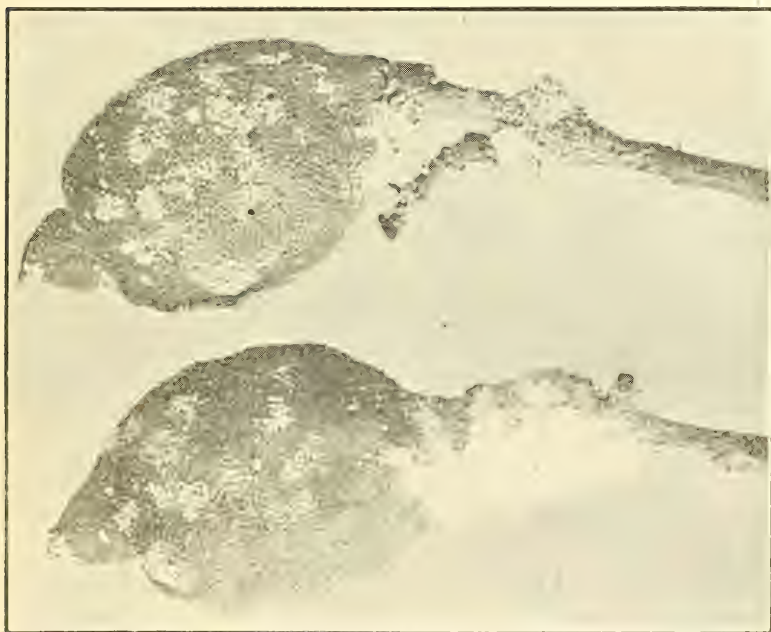


Figure 286 Mealy bug on lemons.





Figure 287. Mealy bug on oranges.

crawii (Coq.)  
 cupressi (Col.)  
 dudlei Col.)  
 ephedrae (Coq.)  
 hymenoclae (Coc.)  
 iceryoides (Mask.)  
 junipari Ehr.  
 longipennis—adonidum.  
 maritimus (Ehr.)  
 obscurus Es.

pseudonipae (Coc.)  
 quercus (Ehr.)  
 ryani (Coq.)  
 salinus (Coc.)  
 sequoiae (Col.)  
 solani (Coc.)  
 yuccae—Ceroputa.

Pseudolecanium distichium—Sphaerococcus.

Pulvinaria. Antennal formulæ: 1758 vitis 3 4 5 2 8 1 (6 7), (3 5) (2 4) (6 7) 8 1. 1870 floccifera 3 2 4 5 8 (1 6 7). 1873 camelicola 3 2 8 (1 4 5) (6 7). 1892 psidii (3 8) 1 (4 5) (6 7). 1893 bigloviae (2 3) 4 (5 8) (6 7). 1896 amygdali 3 4 8 2 5 (6 7) 1898 rhois 3 (1 2 4) 5 8 6 7. 1901 ehrhorni 3 (4 5) 1 (8 6 7) 1906 pluchae 3 (2 4) 1 5 8 6 7.

Pulvinaria amygdali Coc.  
 bigloviae Coc.  
 camelicola Sign.  
 ehrhorni King.  
 innumerabilis—vitis.

Ripersia festucae Kuw.

Saissetia, 1782. oleae. 1867. hemisphaericum: dorsal pits not in polygonal areas.  
 Saissetia hemisphaericum (Targ.)

villosa Ehr.  
 Ripersiella kelloggi E. & C.  
 pluchae Ehr.  
 psidii Mask.  
 rhois Ehr.  
 vitis (Linn.)



Figure 289. Hemispherical scale on leaf of orange.



Figure 288. Male puparia of Hemispherical scale.

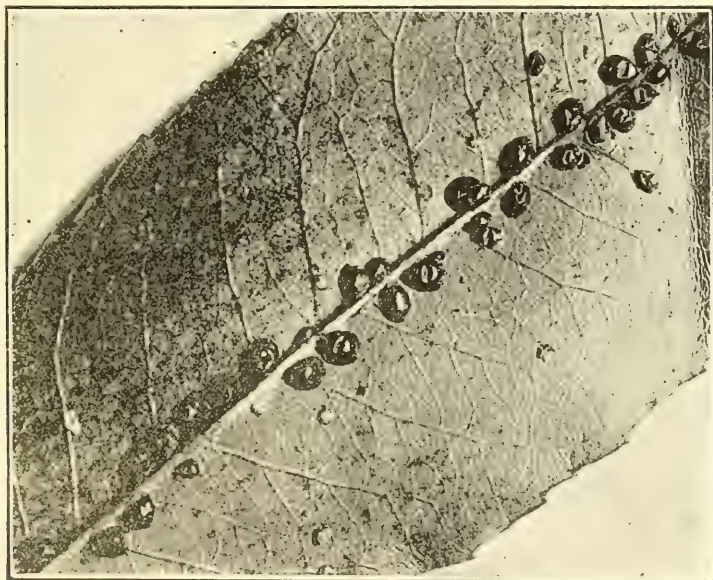


Figure 290. Hemispherical scale, *Saissetia hemisphaerica*, on leaf of Christmas berry.



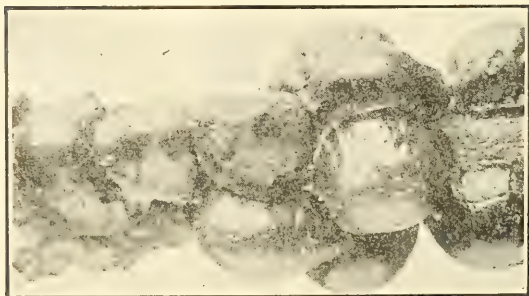


Figure 291. Hemispherical scale on twig of orange.  
oleæ Bern.



Figure 293 Black scale on lemon.



Figure 292. Black scale on Abutilon.



Figure 294. Mature Black scales.

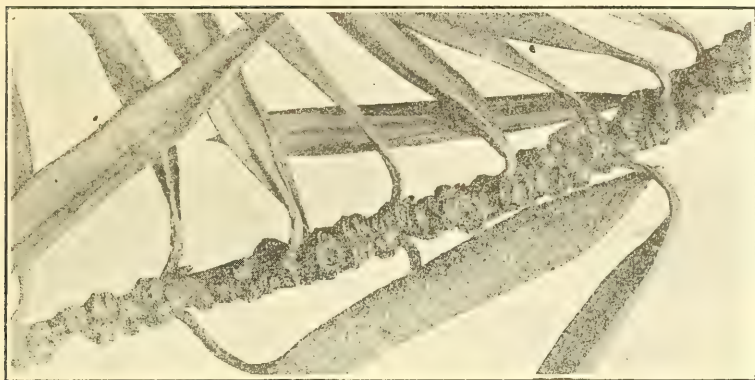


Figure 295. Black scale on olive.



Figure 296. Black scale on twig producing smut on leaves below.

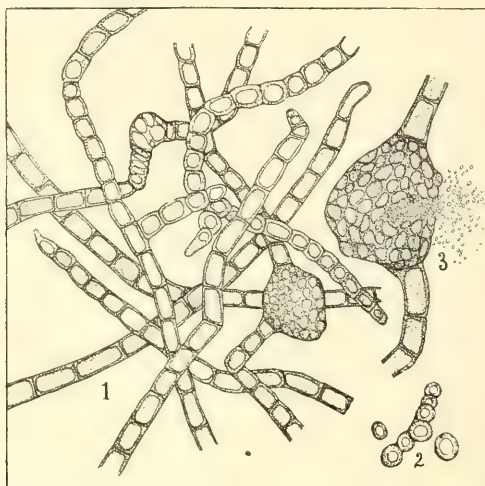


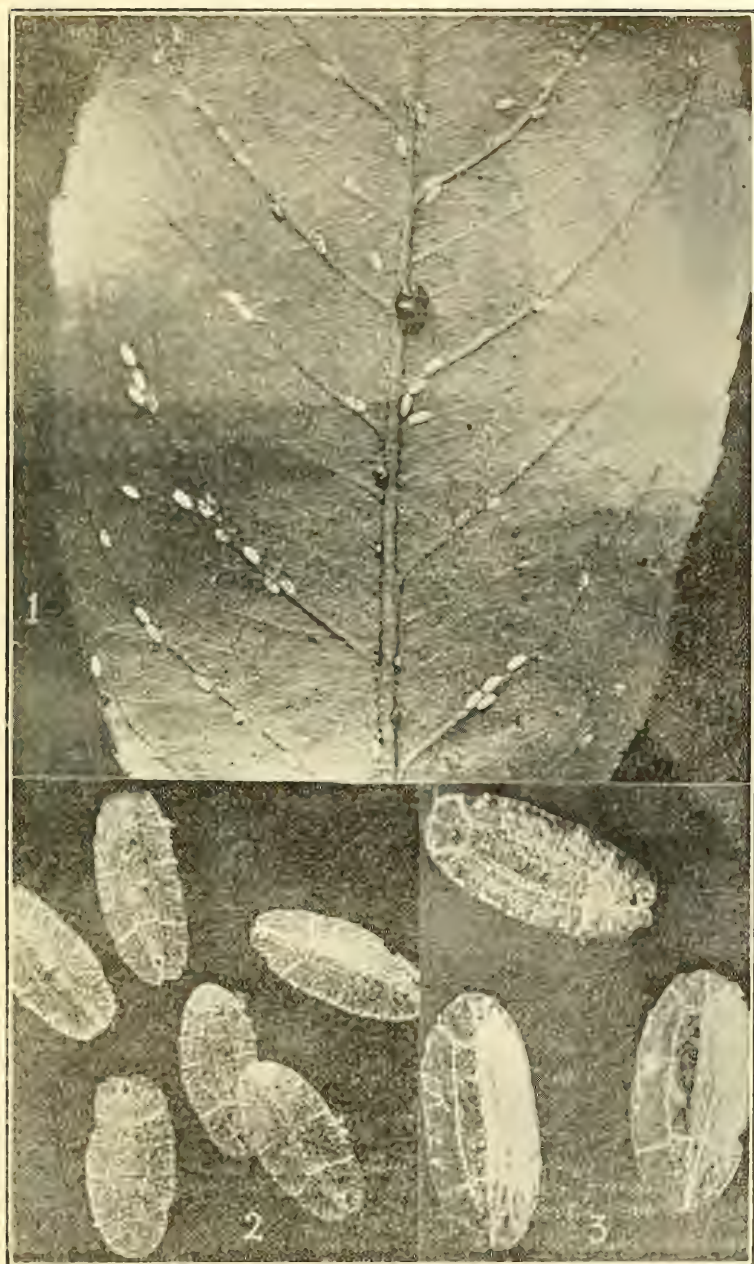
Figure 297. The sooty mold fungus. Much enlarged. 1 Mycelium. 2 Conidia. 3 Pycnidia with immature spores.



Figure 299 Washing oranges to remove sooty mold fungus which grows in the so-called honeydew from the Black scale.

Figure 300. 1 Male of Black scale. 2 Same enlarged. 3 Puparia of Hemispherical scale. Same magnification as 2. (Opposite page.)





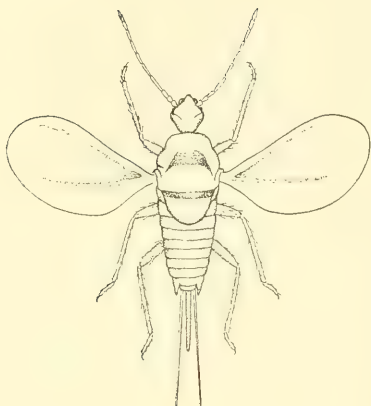


Figure 302 Male of Black scale.



Figure 305. Black scale on barbary.

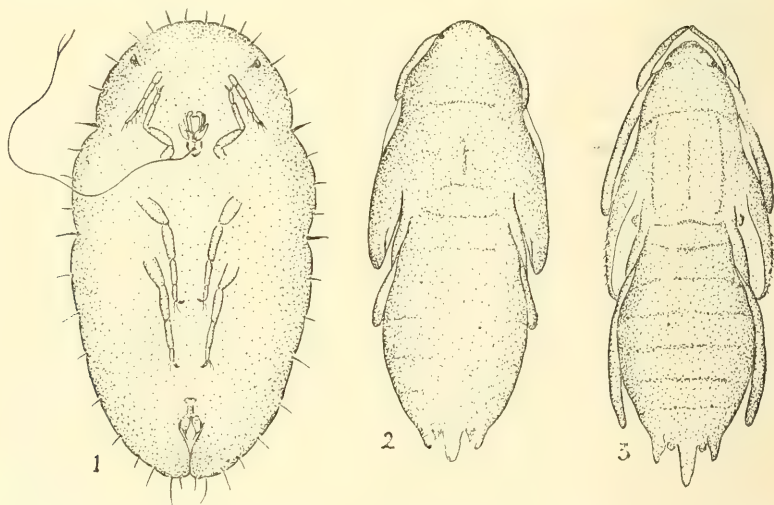
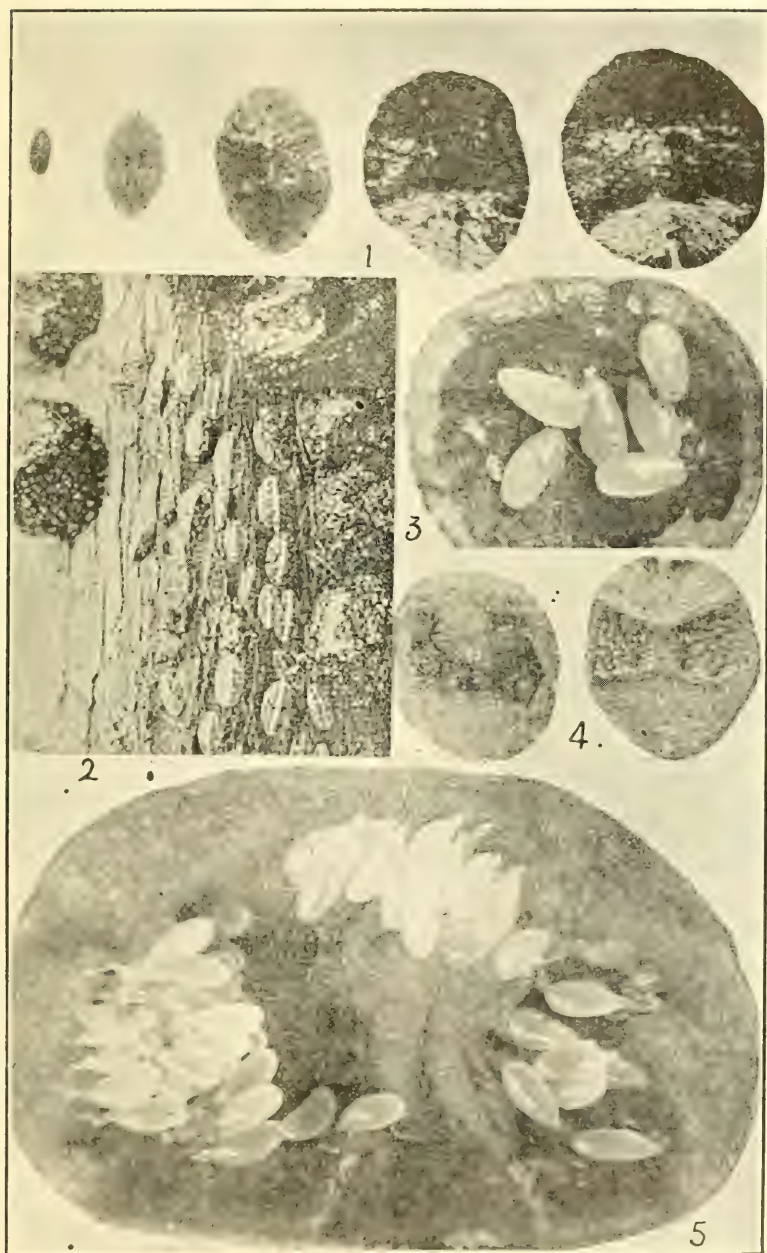


Figure 303 Development of the male of the Black scale. 1 Second stage 2 Propupa. 3 Pupa.

Figure 304. 1 Different stages of Black scale. 2 Young Black scale shortly after settling. 3 Eggs of *Rhizobius ventralis* under Black scale. 4 Hemispherical scale on left and Black of same size on right. 5 Inverted Black scale with 50 eggs of *Scutellista*. (Opposite page.)





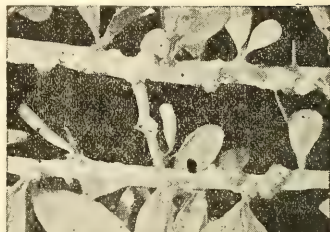


Figure 306. *Lecanium quercifex* on oak. Figure 301. Black scale on orange.

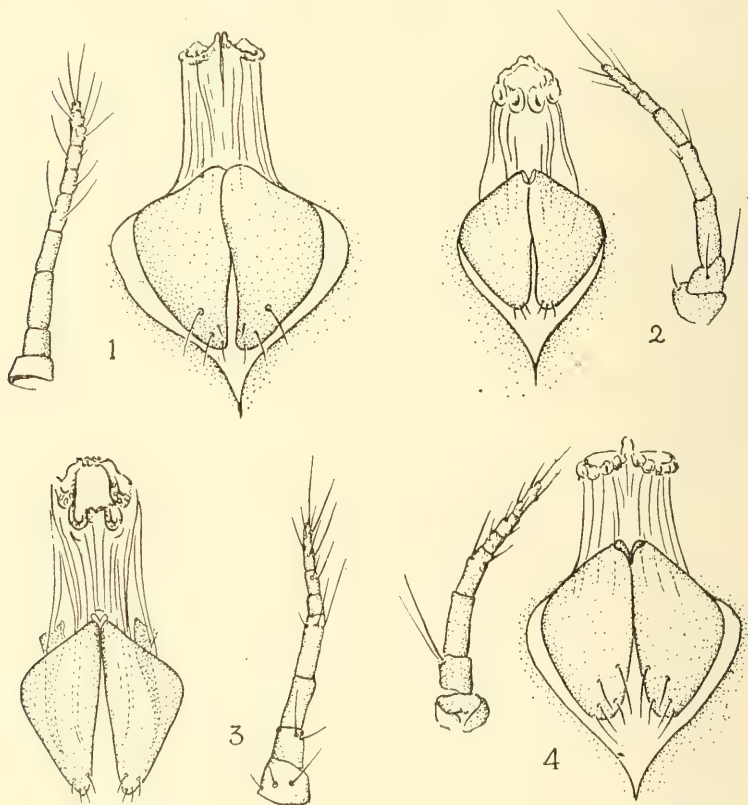
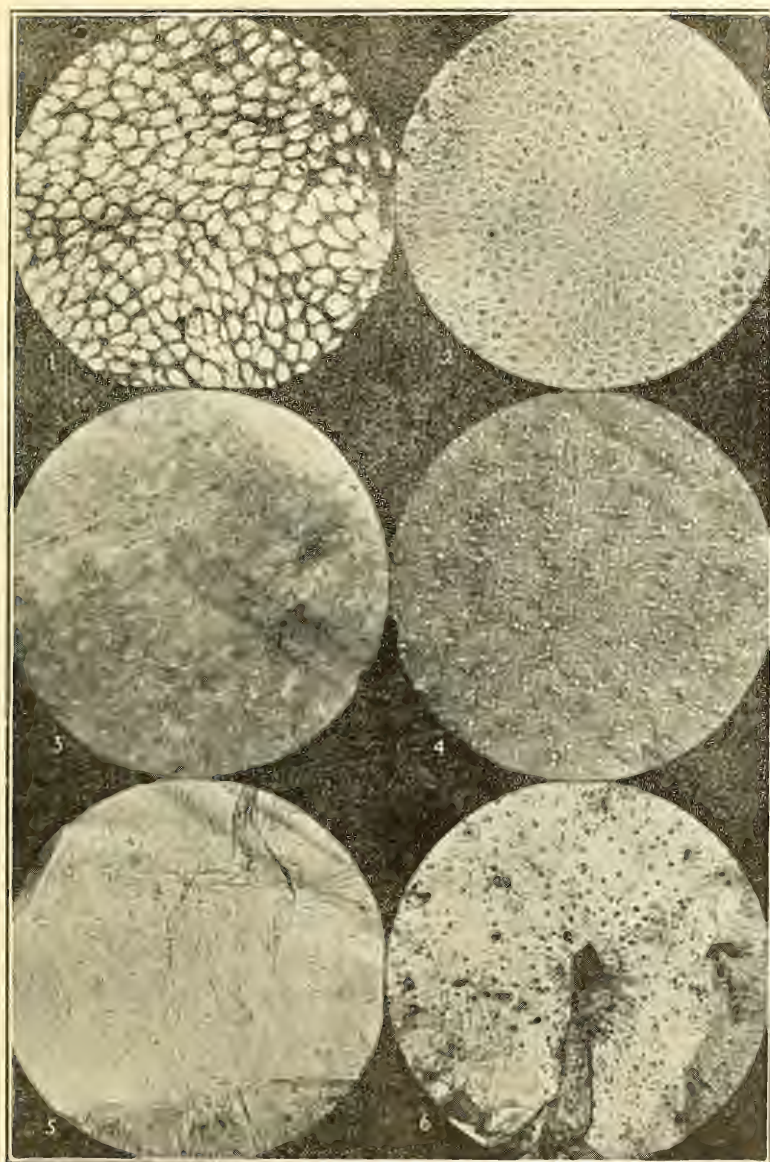


Figure 306. Antennæ and anal lobes. 1 *Saissetia oleæ*. 2 *Lecanium prunosum*. 3 *Coccus hesperidum*. 4 *Lecanium corni*.

Figure 307 Photomicrographs of derm pores. 1 *Saissetia oleæ*. 2 *Saissetia hemisphaerica*. 3 *Lecanium corni*. 4 *Lecanium*. 4 *Lecanium prunosum*. 5 *Lecanium* sp. on *Heteromeles*. 6 *Coccus hesperidum*. (Opposite page)





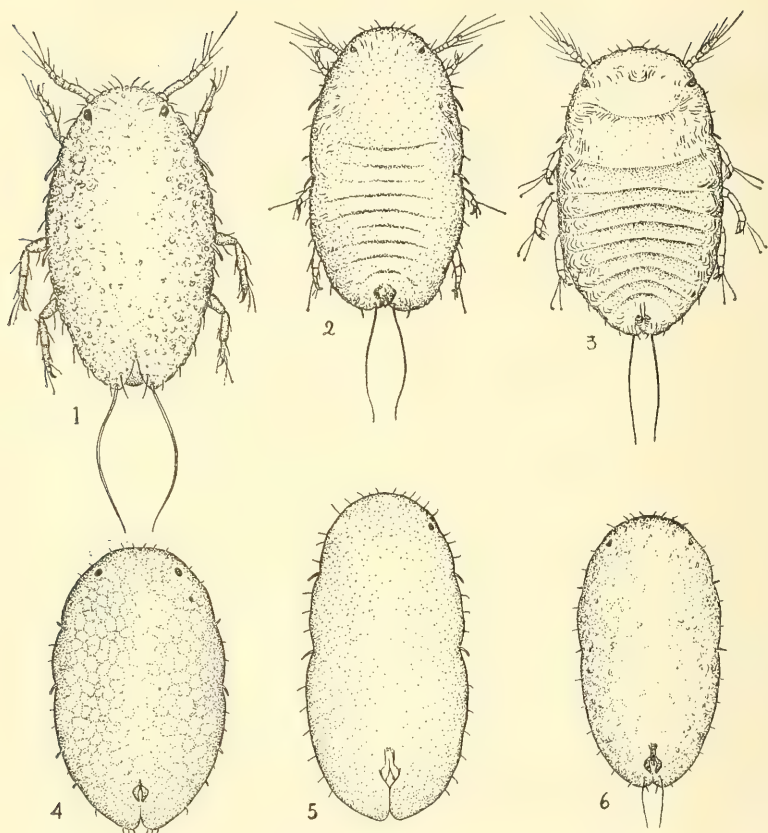


Figure 308. First and second stages of unarmored scale insects. 1 and 4, *Saissetia oleæ*. 2 and 5 *Coccus hesperidum*. 3 and 6 *Lecanium corni*.

<i>Sphærococcus bambusæ</i> — <i>Chætococcus</i> .	<i>Vinsonia stellifera</i> (Westw.)
<i>distichlium</i> (Kuw.)	<i>Xerophilaspis prosopidis</i> (Coc.)
<i>Targionia bigeloviae</i> (Coc.)	<i>Xylococcus macrocarpæ</i> Col.
<i>dearnessi</i> (Coc.)	<i>quercus</i> Ehr.

### *THRIPSINA.*

The thrips have been largely neglected by entomologists until within the last few years. The damage done by the pear thrips first attracted great attention and later the orange thrips and numerous other species have

been carefully studied. The most troublesome species are the pear thrips, *Physothrips pyri*, the onion thrips, *Thrips tabaci*, the greenhouse thrips *Heliothrips hæmorrhoidalis*, the orange thrips *Physothrips citri*, and the grass thrips *Frankliniella tritici*. A number of species are known to feed on other insects.

## SYNOPSIS OF GENERA.

**Sercothrips:** abdomen with a silky lustre due to covering of extremely fine hairs.

**Physothrips:** abdomen with saw-like ovipositor, and antennæ eight jointed. **Heliothrips** and **Echinothrips:** body reticulate, the latter with prothorax as long as head. **Limothrips:** tibiæ with a pair of stout spines near the tip. **Odontothrips** and **Franklinella:** with prominent spines at front angles of prothorax, the latter with tooth at end of front tibiæ.

**Trichothrips:** abdomen without saw-like ovipositor and head about as wide as long. **Haplothrips:** antennæ seven jointed.

**Thrips:** antennæ seven jointed. **Parenothrips:** body reticulate.

**Æolothrips:** antennæ nine jointed. **Orothrips:** wings with dark cross bands. **Erythrothrips:** wings with longitudinal bands. **Ankothrips:** last four abdominal segments not closely united.

**Liothrips.** **Megalothrips:** head more than twice as long as wide. **Hoplothrips:** with tooth at inner side of front femora. **Cephalothrips** and **Cryptothrips:** wings rudimentary, the latter with spine bearing warts on cheeks. **Phlæothrips:** cheeks with spine bearing warts.

Synopsis:— Moulton, U. S. Ent. Tech. Bulletin 21, Jones, *ibid.* 23.

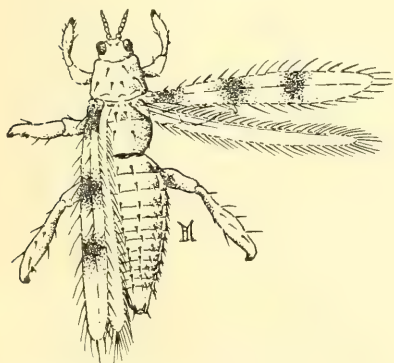


Figure 310. *Scolothrips sexmaculatus*  
Feeds on Red spider.

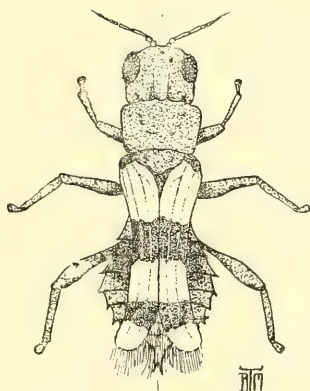


Figure 309 *Heliothrips fasciatus*.

## ÆOLIOTHIRIPIDÆ.

*Æolothrips fasciatus* Linn.  
*nasturtii* Jones.

*kuwanaii* Moul.  
*longiceps* Cra.



*Ankothrips robusta* Cra.

*Calothrips woodworthii*—*Heliothrips*

*fasciatus*.

*robustus*—*kuwanali*.

*Erythrothrips arizonæ* Moul.

*Orothrips kelloggi* Moul.

*yosemite*—*kelloggi*.

#### THRIPIDÆ.

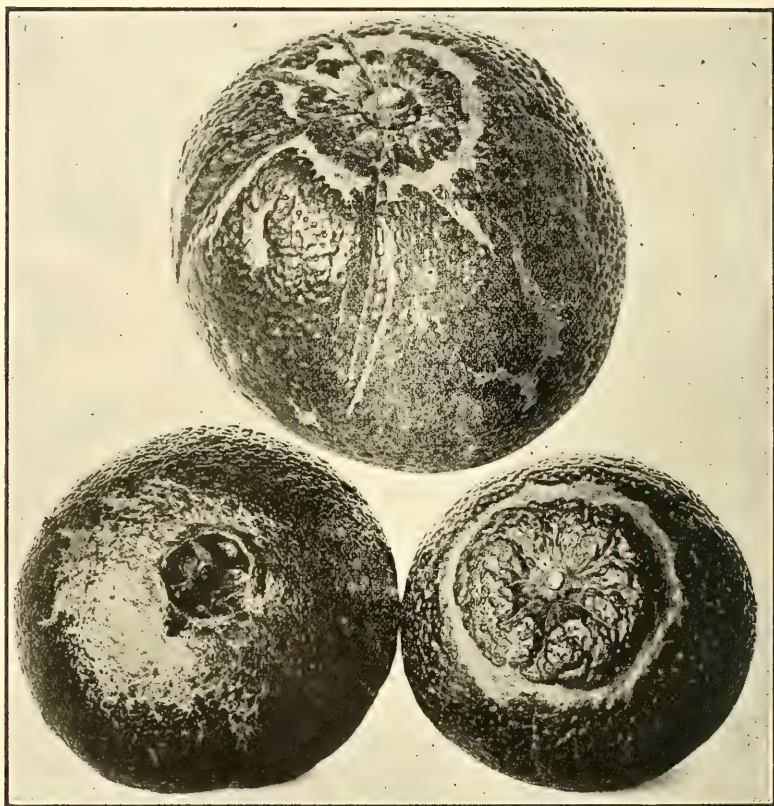


Figure 311. Work of thrips *Euthrips citri* on fruit.

*Anaphothrips albus*—*Euthrips*.

*striatus*—*Euthrips*.

*tricolor*—*Euthrips*.

*zeæ*—*Euthrips*.

*Anthothrips flavipes*—*Haplothrips*.

*niger*—*Haplothrips*.

*Aptinothrips rufus* Gm.

*connaticornis*—*rufus*.

*Echinothrips mexicanus* Moul.

*Euthrips albus*—*Physothrips*.

*albus* (Jones).

*californicus*—*Frankliniella tritici*.

*californicus*—*Odontothrips ulicis*.

*citri*—*Physothrips*.

costalis—Physothrips.  
 ehrhorni—Physothrips.  
 helianthi—Frankliniella  
 longirostrum—Physothrips.  
 minutus—Frankliniella.  
 occidentalis—Frankliniella.  
 orchidii—Physothrips.

parvus—Physothrips.  
 pyri—Physothrips.  
 striatus (Osb.)  
 tricolor (Moul.)  
 tritici—Frankliniella.  
 ulicis—Odontothrips.  
 zææ (Moul.)



Figure 312. Characteristic rings at stem end of small oranges made by thrips. *Physothrips citri*.

**Frankliniella** 1855 *tritici*. (11) 1895 *occidentalis*: pale lemon yellow. 1907 *minutus*: postocular spines wanting. 1911 *helianthi*: *tritici*—not shaded with orange.

**Frankliniella** *helianthi* (Moul.)  
*minutus* (Moul.)  
*occidentalis* (Perg.)

*tritici* (Fitch).  
*Haplothrips flavipes* (Jones).  
*niger* (Osb.)

**Heliothrips** 1833 *hæmorrhoidalis*. 1895 *fasciatus*: hind and middle tibiae brown.

**Heliothrips** *fasciapennis* Hinds.  
*fasciatus* Perg.

*hæmorrhoidalis* Bouche.  
*Limothrips setariæ* Jones.

**Physothrips** 1904 *pyri*. (07) 1907 *orchidii*: head distinctly wider than long. *ehrhorni*: (y2) *pyri*—eyes not pilose. 1909 *citri*: (11) *orchidii*—last two antennal segments together only about half as long as the sixth. 1901 *parvus*: *citri*—wings shaded brown. *albus*: (12) *citri*—color white. 1912 *costalis*: *albus*—ring vein conspicuous. *longirostrum*: *ehrhorni*—postocular spines wanting.

**Physothrips** *albus* (Moul.)  
*citri* (Moul.)  
*costalis* (Jones).  
*ehrhornii* (Moul.)

*longirostrum* (Jones).  
*orchidii* (Moul.)  
*parvus* (Moul.)  
*pyri* (Dan.)

*Odontothrips ulicis* (Hal)

*Sericothrips albus* Jones.

*apteris* Dan.

*moultoni* Jones.

*reticulatus* Moul.

*stanfordii* Moul.

*variabilis* Bea.

*Thrips bremneri* Moul

*femoralis*—*microcephalus*.

*hæmorrhoidalis*—*Heliothrips*.

*madronii* Moul.

*magnus* Moul.

*microcephalus* Jones. (ms.)

*tabaci* Lind.

*tritici*—*Euthrips*.

*ulicis*—*Euthrips*.

*Paranthrips dracænæ* Hæg.

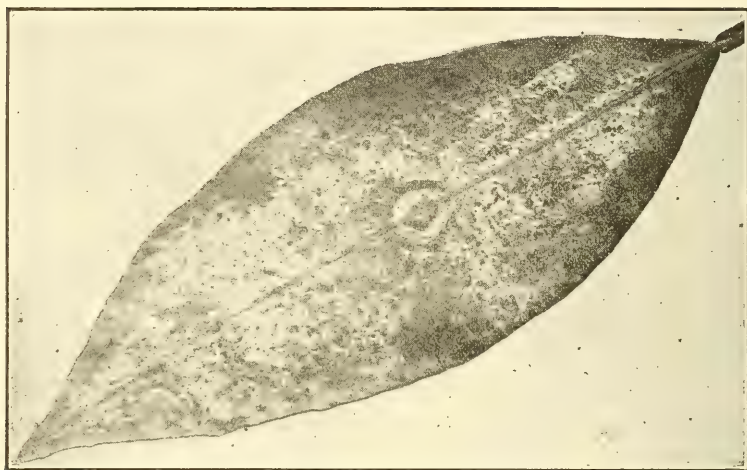


Figure 313. The work of *Heliothrips hæmorrhoidalis* on orange leaf.

#### PHLÆOTHRIPIDÆ.

*Trichothrips dens* Moul.

*dumosa*—*ilex*.

*ruber* Moul.

*femoralis* Moul.

*ilex* Moul.

*Hoplothrips corticis* Serv.

*Acanthothrips doanei*—*Hoplothrips*

*corticis*.

*Cryptothrips californicus*—*Leptothrips*

*aspersus*.

*salacis* Jones.

*Cephalothrips errans* Moul.

*Phlæothrips armiger* Jones.

*jennæi* Jones.

*Liothrips fasciculatus* Cra.

*stenoceps*—*fasciculatus*.

*mcconnelli*—*Leptothrips asper-*

*sus*.

*Megalothrips hesperus* Moul.

*Leptothrips aspersus* Hinds.

*russelli* Mor.

#### PEDICULINA.

##### PEDICULIDÆ.

*Hematopinus suis* (Linn.)

*Pediculus capitis* DeG.

*suis* *Hematopinus*.

*vestimenti* Leach.

*Phthirus inguinalis* Leach.

## ORTHOPTERA.

The Orthoptera is the first group to leave abundant fossil remains and for this reason has been considered by some entomologists as the ancestral group of winged insects. They are the first group of insects to become hard bodied which probably explains in part the geological record. The Order was grouped with the Hemiptera by Linnæus and has been combined with the Pseudoneuroptera by many German entomologists. On the other hand it

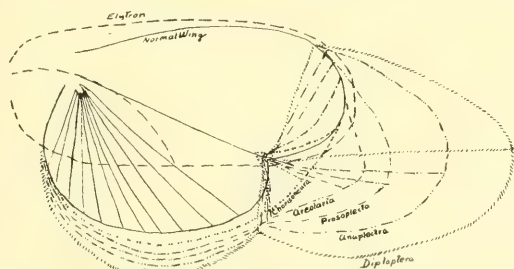


Figure 314. Diagram showing a series of cockroach wings with fold areas approaching the structure found in the wing of an earwig.

has not infrequently been split into two orders and occasionally into several. The peculiar wing structure in the earwigs has occasioned their separation as a separate order tho it has been shown that the cockroaches show an approach and and is doubtless the group from which they arose. The three families of jumping Orthoptera are the more modern branch of the order. the other families fall into two series, the cockroaches and earwigs forming a group distinct from all other Orthoptera. and perhaps representing a different line of descent.

### SYNOPSIS OF FAMILIES.

**Acrididæ:** hind legs enlarged for leaping and antennæ shorter than body.



**Locustidæ:** similar, but antennæ long. **Gryllidæ:** feet three-jointed.  
**Blattidæ:** body flattened. **Forficulidæ:** with forceps at end of body.  
**Phasmidæ.** **Mantidæ:** front legs greatly enlarged.

#### ACRIDIDÆ.

The migratory members of this family have been known as locusts but the more common name of these insects when not migrating is grass hoppers. Locusts probably rank first of all insect pests.

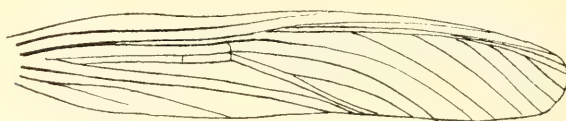


Figure 315. Diagram showing the principle veins in the wing of Acrididæ.

#### SYNOPSIS OF GENERA.

**Melanoplus:** prothorax spined beneath and metasternal lobes as broad as long. **Dracotettix:** apical spurs on both sides of hind tibiæ. **Parapomala,** **Leptysma** and **Arnilla:** face very oblique, the first with hind tibiæ expanded

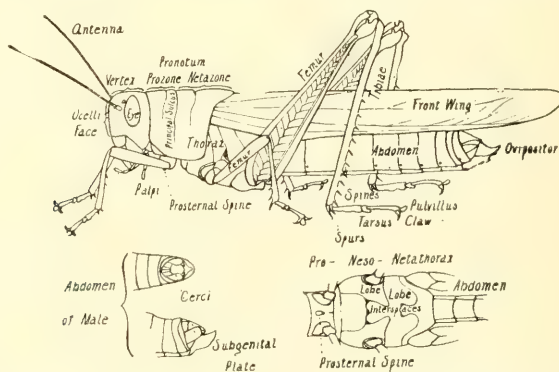


Figure 316. Structures used in the classification of grasshoppers.

apically and the second with head as long as pronotum. **Dactylotum:** less than nine spines on outer margin of hind tibiæ. **Bradynotus:** wingless. **Pæciilotettix:** no median carina. **Ædaleonotus:** cerinæ interrupted between sulci. **Hesperotettix:** crest equal on prozona and metazona. **Æoloplus:** pronotum narrowest in front of principal sulcus.

**Triberotropus:** pronotal carinæ evident, twice intersected, the principal sulcus distinct on sides. **Aconia** and **Heliastes:** crest deeply interrupted between sulci, the latter with middle independent vein feeble or wanting.



**Hadrotettix:** pronotum not crested in front. **Daratmena:** sides of metazona narrowed beneath. **Mestobregma:** lateral canthi bending at principal sulcus or absent in front. **Circotettix:** posterior veins of hind wings swollen in the middle. **Conozoa:** crest as high as on prozona.

**Hippiscus:** prosternum rough.

**Schistocerca:** prosternum spined.

**Orphulella:** face and vertex angled or the latter with distinct foveæ. **Gymnes, Bootettix** and **Ligurotettix:** top of head bent up from pronotum, the last **Opeia, Horisodotes** and **Napaia:** antennæ triquetrus, the first with inner spurs of hind tibiæ unequal, the last with front wings shorter than abdomen two very distinctly so, in the second forming an acute angle with face. **Plectrotettix, Brunneria, Stenobothris, Eupnigodes, Aulocara, Psœssa** and **Stirapueura:** temporæ visible from above, the first with face and vertex not meeting in an angle as seen from side, the second and third with temporæ more than twice as long as broad, the former with prozona longer than metazona, the fourth with pronotum shorter than head, the fifth with prozona longer than metazona and the last with temporæ visible throughout the length. **Ænomus** and **Amphitornus:** with a distinct median carina on prothorax. **Alphia:** tibiæ red.

**Telmotettix:** pronotum extending to tip of abdomen. **Paratettix:** vertex not narrowed anteriorly. **Tettix** and **Merotettix:** vertex advanced beyond eyes, the latter with vertex wider than an eye.

**Arphia, Cortophaga, Chimarocephala** and **Encoptolophus:** interspace between metasternal foramina longer than broad, the first with hind wings bright colored, the second with middle independent vein midway between others and the third with head compressed. **Camnula, Agymnastus** and **Lep-rus,** principal sulcus feeble or wanting on sides of pronotum, the first with pronotal carina conspicuous, the second with wings shorter than abdomen. **Lactista:** costal margin of wing thickened nearly to tip. **Scirtetica, Microtus** and **Spharagemon:** with band on middle of wings, the first with crest feebly intersected, the last with intercalary vein.

**Acridium alutacea—Schistocerca.**

**borckii—Melanoplus.**

**differentialis—Melanoplus.**

**femurrubrum—Melanoplus.**

**granulatus.—Tettix.**

**shoshone—Schistocerca.**

**vaga—Schistocerca.**

**Æolophus arcuatus—chenopodii.**

**californicus Scud.**

**chenipodii (Brun.)**

**Agynastus ingens (Scud.)**

**Alpha cinera (Brun.)**

**Amphitomus ornatus McN.**

**Antonia integra Scud.**

**Arnilia mexicana (Saus.)**

**Arphia behrensi Saus.**

**hesperiphila Rehn.**

**ramona Rehn.**

**sulphurea (Fabr.)**

**Aulocara elliotti Thom.**

**Bootettix argentatus Brun.**

**Bradynotus obesa (Thom.)**

**referata Scud.**

**satur Scud.**

**Brunneria shastana Scud.**

**Caloptenus atlantis—Melanoplus.**

**collaris—Ædalionotus enigma.**

**femoratus—Melanoplus.**

**femurrubrum—Melanoplus.**

**spretus—Melanoplus.**

**viridis—Hesperotettix.**

**Camnula pellucida (Scud.)**

**Chimarocephala behrensi Saus.**

**brevipennis—Chortophaga.**

*pacifica* (Thom.)  
*Chortophaga brevipennis* (Scud.)  
*thallassinus* Saus.  
*Circotettix maculatus* Scud.  
*occidentalis* (Brun.)  
*shastanus* Brun.  
*verruculatus* (Kirby.)  
*Conozoa behrensi* Saus.

*Encoptolophus pallidus* Brun.  
*sordidus*—*pallidus*.  
*Eupnigodes megacephala* McN.  
*Gomphocerus pelidna*—*Orphulella*.  
*shastana*—*Brunneria*.  
*Gryllus carolina*—*Dissosteira*.  
*sulfurea*—*Arphia*.  
*Gymnes punctatus* Scud.

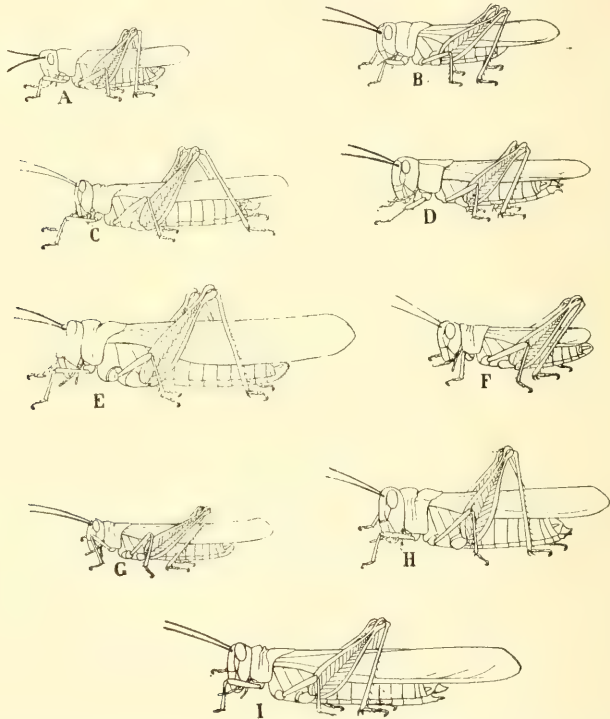


Figure 317. Common California grasshoppers. A *Chimarocephala pacifica*, B *Arphia sulphurea*, C *Conozoa behrensi*, D *Camnula pellucida*, E *Dissosteira spureata*, F *Hadrotettix mundus*, G *Lactista gibbosus*, H *Circotettix shastanus*, I *Trimerotropis pseudofasciatus*.

*koebelei* Brun.  
*rebellis*—*Trimerotropis*.  
*sulcifrons* (Scud.)  
*wallula* (Scud.)  
*Dactylotum variegatum* (Scud.)  
*Derotmena delicatulum* Scud.  
*saussureanum* Scud.  
*Dissosteira monstrosus* Brun.  
*plutonius* Brun.

*Hadrotettix mundus* Scud.  
*Heliastus aridus* (Brun.)  
*californicus* (Thom.)  
*minimus* (Scud.)  
*Hesperotettix festivus* Scud.  
*pacificus* Brun.  
*pratensis* Scud.  
*viridis* (Thom.)  
*Hippiscus aurilegulus* Scud.

californicus Scud.  
calthulus (Saus.)  
lateritius (Saus.)  
marmoratus Scud.  
neglectus (Thom.)  
paradalis (Saus.)

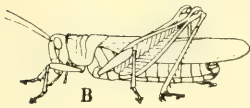


Figure 318. Common California grasshoppers. A. *Bradynotus satur*. B. *Edal-eonotus enigma*.

stigmaticus Scud.  
zapotecus (Saus.)  
*Horresidotus cinereus* Scud.  
*Lactista gibbosa* Saus.  
*Leprus glaucipennis* Scud.  
ingens—*Agymnastus*.  
intermedius Saus.  
*Leptysma marginicollis* Serv.  
*Ligurotettix coquilletti* McN.  
*Locusta verruculata*—*Circotettix*.

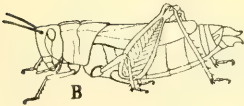


Figure 319. Common California grasshoppers. A. *Telmatettix aztecum*. B. *Stenobothris Oregonensis*.

*Mastobregma hyalinum* Scud.  
kiowa (Thom.)  
rosaceum Scud.  
*Melanoplus ablutus* Scud.  
affinis—*devastator*.

angelicus Scud.  
ascensus Scud.  
ater Scud.  
atlanis (Riley.)  
blandus Scud.  
borckii (Stal.)  
devastator Scud.  
cinereus Scud.  
consanguineus Scud.  
dealbatus Scud.



Figure. 320 *Melanoplus devastator*, nymph.

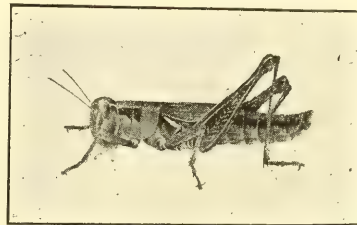


Figure 321. A short winged adult *Melanoplus*.

*differentialis* (Uhl.)  
diminutus Scud.  
femoratus (Burm.)



Figure 322. *Melanoplus differentialis*, nymph.

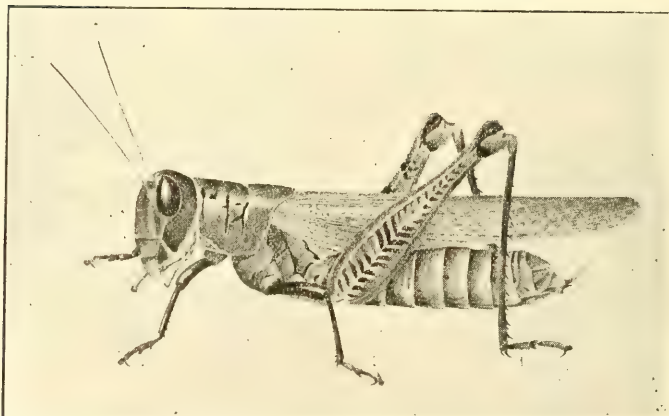


Figure 323. *Melanoplus differentialis*.

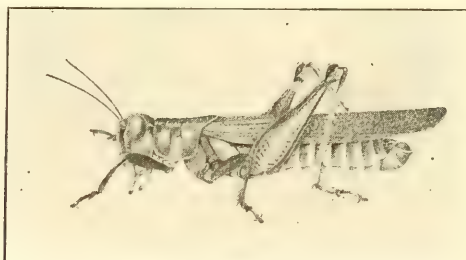


Figure 324. *Melanoplus uniformis*.

femurrubrum (DeG.  
 flavescens Scud.  
 fuscipes McN.  
 gracilipes McN.  
 lepidus Scud.  
 marginatus (Scud.)  
 missionum Scud.  
 nanus Scud.  
 olivaceus Scud.  
 pacificus (Scud.)  
 packardii Scud.  
 phætalotiformis Scud.  
 pinctus Scud.  
 rileanus McN.  
 similis Scud.  
 spretus (Uhl.)  
 tenuipes McN.  
 uniformis Scud.  
 varicus Scud.  
 virgatus McN.

Menotettix pristinum Morse.  
 Morsea californica Scud.  
 Microtus nubila Scud.  
 Napaia gracilis McN.  
 Ochrilidea cinerea—Alpha.  
 CEdaleonotus enigma (Scud.)

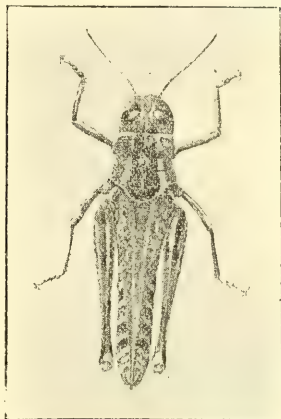


Figure 325. The valley grasshopper, CEdaleonotus enigma.

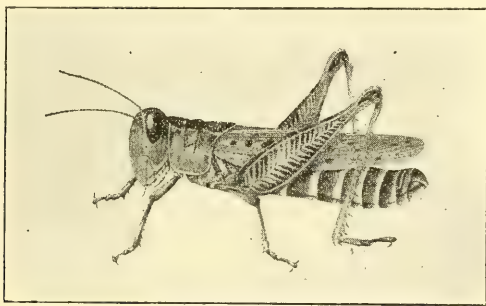


Figure 326. The valley grasshopper, CEdaleonotus enigma.

pellucida—Camnula.  
 CEdocara strangulata—Aulocara elliot-  
 ti.  
 CEdonomus altus Scud.  
 OPeia testacea Scud.  
 Opomala marginicollis—Leptysm.  
 mexicana—Arnilia.  
 Orphula tepanica—Orphulella affinis.  
 CEdipoda cincta—Trimerotropis.

kiowa—Mestobregma.  
 neglectus—Hippiscus.  
 obliterated—Dissosteira spurcata.  
 occidentalis—Circotettix.  
 paradalinus—Hippiscus.  
 Orphulella affinis Scud.  
 compta Scud.  
 pelidna (Burm.)  
 Paratettix hesperinus—Talmotettix.





Figure 327. The use of the hopper dozer for killing grasshoppers.



Figure 238. Preparing to use fire against grasshoppers.

- mexicanus (Saus.)  
 morsea Han.  
 toltecus Saus.
- Paropomala calamus Scud.  
 virgatus Scud.
- Pezotettix atlanis—Melanoplus.  
 borekii—Melanoplus.  
 chenopodii—Æolophus.  
 collaris—Ædaleonotus enigma.  
 enigma—Ædaleonotus.  
 jucundus—Ædalionotus enigma.  
 marginatus—Melanoplus.  
 obesa—Bradynotus.  
 pacificus—Melanoplus.  
 variegatum—Dactylotum.
- Plectrotettix patriæ Scud.  
 Pnigodes megacephala—Eupnigodes.  
 Podisma borekii—Melanoplus.  
 Pœcilotettix coccinatus Scud.  
 Psinidia sulcifrons—Conozoa.  
 wallula—Conozoa.
- Psolœssa maculipennis Scud.  
 texana Scud.  
 hyalina McN.  
 juliana Scud.  
 koebelei Brun.
- Scirtettix occidentalis Brun.  
 Scyllina delicatula—Stiraplura pusilla.  
 Schistocerca alutacea (Harr.)  
 carinata Ccud.  
 shoshone (Thom.)  
 vaga (Scud.)  
 venusta Scud.
- Spharagemon venustum (Stal.)  
 Stauronotus elliotti—Aulocara.  
 Stenobothris oregonensis Scud.  
 Stichippus californicus—Hippiscus.  
 Stirapleura decussata Scud.  
 delicatula—pusilla.  
 pusilla Ccud.
- Telmotettix aztecus Saus.
- aridus Han.  
 hesperinus Morse.
- Tettix aztecus—Telmotettix.  
 granulatus (Kirby.)  
 mexicanus—Paratettix.  
 toltecus—Paratettix.
- Tragocephala brevipennis—Chortopha-  
 ga.  
 pacifica—Chimarocephala.
- Trimerotropis albescens McN.  
 bifasciata Brun.  
 cæruleipennis Brun.  
 cæruleipes Scud.  
 californica Brun.  
 calignosa McN.  
 cincta (Thom.)  
 conspersa McN.  
 coquilletti McN.  
 cristata McN.  
 fallax Saus.  
 ferruginea McN.  
 stigmosus—Hippiscus.  
 zapotecus—Hippiscus.  
 pacifica Brun.  
 pilosa McN.  
 porrecta McN.  
 pseudofasciata Scud.  
 rebellis (Saus.)  
 similis Scud.  
 suffusa—cincta.  
 tesellata McN.  
 thalassica Brun.  
 variegata McN.  
 vinculata Scud.
- Thrincus aridus—Heliastus.  
 californicus—Heliastus.  
 minimus—Heliastus.
- Xanthippus aurilegulus—Hippiscus.  
 cathulus—Hippiscus.  
 lateritius—Hippiscus.  
 pardalinus—Hippiscus.

# LOCUSTIDÆ.

The Locustidæ have been called in some of the books, locusts because of the family name and sometimes grasshoppers because of their grass-green color. Most of the males have the wings modified into musical organs and the best known species is called katd-did because of its song and this name has come to be used for the whole group. Many of the California species are wingless and therefore voiceless. Our largest forms are locally called "potato bug."

## SYNOPSIS OF GENERA.

*Stenopelmatus*: wingless and without pulvilli.

**Ceuthophilus:** wingless. **Tropidischia:** hind tibiæ spined on both sides. **Gam-haurotettix:** front tibiæ hollowed out beneath. **Prioxcnemis** and **Udeopsylla:** palpi short, the last with third joint shorter than fifth.

**Tropizaspis:** with short useless wings and prosternum with two spines.

**Calcopteris:** with short useless wings. **Anabrus:** front tibiæ spined above on both margins. **Atelophus:** with but one spine above. **Clinopleura:** with four. **Idiostatus:** with feeble lateral carinæ on thorax. **Steiroxys** and **Idionotus:** with carinæ well developed and divergent behind in the last.

**Scudderia. Dichopetata:** front coxæ unarmed. **Arethæa:** hind margin of wings sinuate. **Platylyra:** front wings as long as hind wings.



Figure 329. Common California katydids. A. *Scudderia furcifera*. B. *Anabrus simplex*. C. *Ceuthophilus pacificus*. D. *Ateloplus notatus*. E. *Stenopelmatus irregularis*.

*Anabrus simplex*

*Arethæa consuetipes* Scud.

*Arytropteris steindachneri*—*Tropizaspis*.

*Ateloplus notatus* Scud.

*Calcopteris æqualis* Scud.

*femorata* Scud.

*fuscopunctatus* Scud.

*Capnobotes brunneri* Scud.  
*occidentalis* (Thom.)  
*Ceuthophilus bilobatus*—*Gamarotettix*.  
*californicus* Scud.  
*celatus* Scud.

*Dichopetala brevicauda* Scud.  
*Gammarotettix bilobatus* (Thom.)  
*californicus*—*bilobatus*.  
*Hemiodopsylla californicus* Scud.  
*platiceps* S.&P.

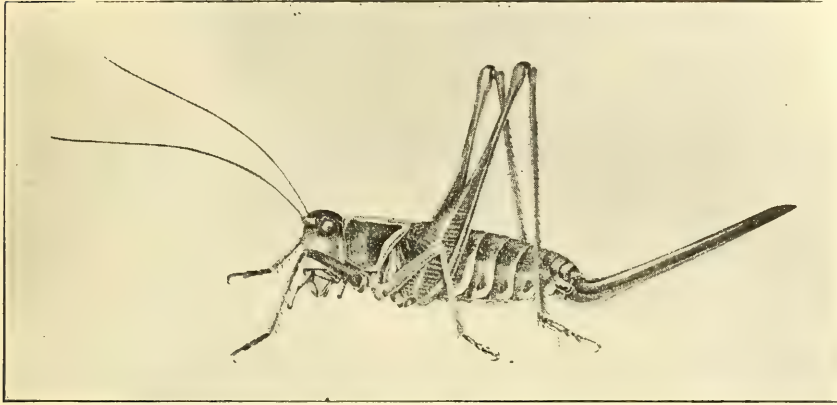


Figure 330. *Clinopleura melanopleura*. female.

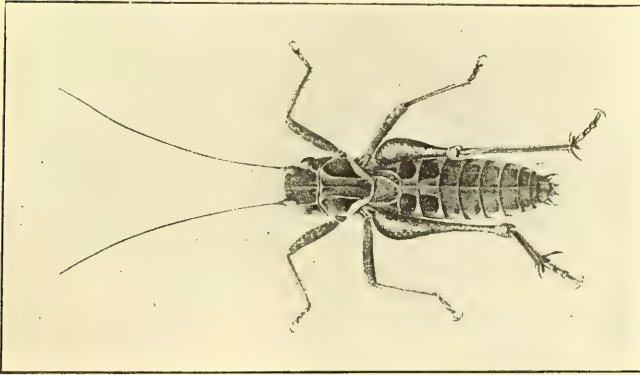


Figure 331. *Clinopleura melanopleura*. male.

*henshawi* Scud.  
*pacificus* Thom.  
*vinculus* Scud.  
*Clinopleura flavomarginata* Scud.  
*melanopleura* (Scud.)  
*conocephalus acutatus* Scud.  
*mexicanus* Saus.

*Idionotus brunneus* Scud.  
*Idiostatus bilineatus* (Thom.)  
*hermani* (Thom.)  
*Locusta occidentalis*—*Capnobotes*.  
*Orchelimum agile* Deg.  
*Phaneroptera mexicana*—*Scudderia*.  
*Prixocnemis validus* Scud.

*Platylyra californica* Scud.  
*Raphidophora xanthostoma*—*Tropidischia*.  
*Scudderia furcifera* Scud.  
     *mexicana* (Saus.)  
*Steiroxys bilineatus*—*Idiostatus*.  
     *borealis* Scud.  
     *hermani*. *Idiostatus*.  
     *melanopleura*—*Clinopleura*.  
*Stenopelmatus californicus* Brun.  
     *histrio* Saus.  
     *irregularis* Brun.

*longispina* Brun.  
     *oculatus* Scud.  
     *pictus* Scud.  
*Tropidischia Xanthostoma* (Scud.  
*Tropizaspis castanea* Scud.  
     *diabolica* Scud.  
     *ovata* Scud.  
     *steindachneri* (Herm.)  
*Udeopsylla nigra* Scud.  
*Xiphidium occidentale* Morse.  
     *spinosum* Morse.

#### GRYLLIDÆ.

The crickets have musical organs on the wings similar to those of the Locustidæ with which family they are very closely allied.

#### SYNOPSIS OF GENERA.

*Gryllus*. 1775. *assimilis*. 1838. *pennsylvanicus*: totally black. 1901. *intiger*. black except wings. *vocalis*: black except shoulder stripes.

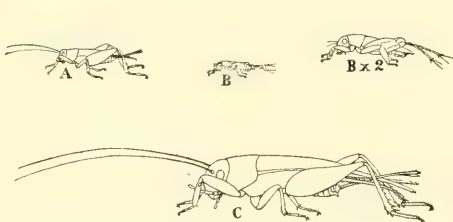


Figure 332. Common California crickets.  
 A. *Nemobius mexicanus*. B. *Tridactylus minutus*. C. *Gryllus vocalis*.

*Gryllus assimilis* Fabr.  
     *intiger* Scud.  
     *pennsylvanicus* Burm.  
     *vocalis* Scud.  
*Gryllotalpa cultiger* Uhl.  
*Myogryllus sicarius* Scud.  
*Myrmecophila formicarium* Scud.  
*Nemobius mexicanus* Walk.  
     *neomexicanus* Scud.  
*Œcanthus californicus* Walk.  
*Tridactylus apicalis* Say.  
     *minutus* Scud.

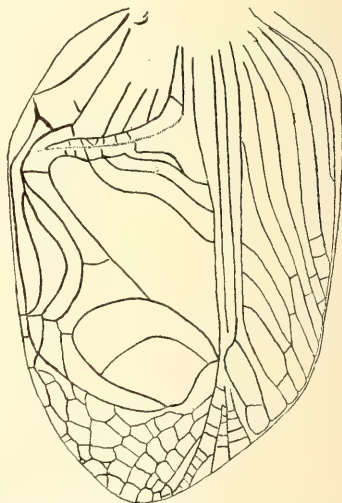


Figure 333. Front wing of a male cricket showing modification as a musical organ.

#### MANTIDÆ.

The Mantids are predatory, catching other insects by their greatly developed front legs.

*Litaneutria obscura* Scud.  
     *pacifica* Scud.

*skinneri* Rehn.  
*Stagmomantis californicus* R. & H.



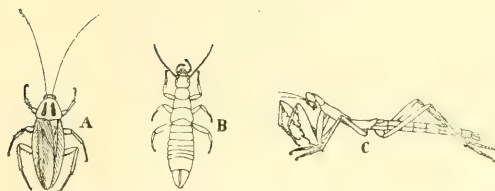


Figure 334. Common California Orthoptera. A. *Blattella germanica*. B. *Sphingolabis californicus*. C. *Litaneutria pacifica*.

PHASMIDÆ.

The Phasmidæ includes the walking sticks and the leaf insects of the trocics. Only a few rare species of walking sticks occur in this state.

*Pacillus coloradus*—*Parabascillus*.

*truncata* Caud.

*Parabascillus coloradus* Scud.

*Spermyle arbuscula*—*Pseudospermyle*.

*Pseudospermyle arbuscula* Rehn.

*Timena californicus* Scud.

FORFICULIDÆ.

We have one fairly common wingless species of earwig.

*Doru linearis* (Dorn.)

*Sphingolabis californica*—*Doru* line-

*tæniata* (Dorn.)

aris.

*Prolabia arachnis* Yer.

*tæniata*—*Doru*.

BLATTIDÆ.

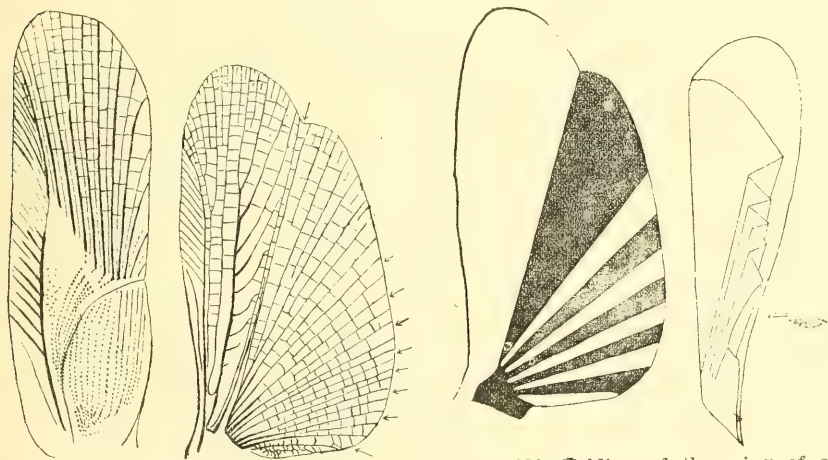


Figure 335. Venation of a cockroach.

Figure 336. Folding of the wing of a cockroach.

Cockroaches have not been annoyed by cockroaches till the last few years and now only in very limited localities.

*Blatta orientalis* Linn.

*Blattella germanica* (Linn.)

*germanica*—*Blattella*.

*Cryptocercus punctulatus* Scud.

*Loboptera americanum* Scud  
*Planchora hyalina* Saus.

*Phyllodromia germanica*—*Blattella*.  
*Stylopyga orientalis*—*Blatta*.

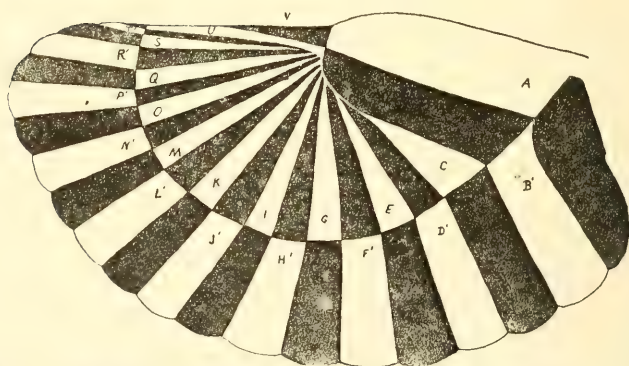
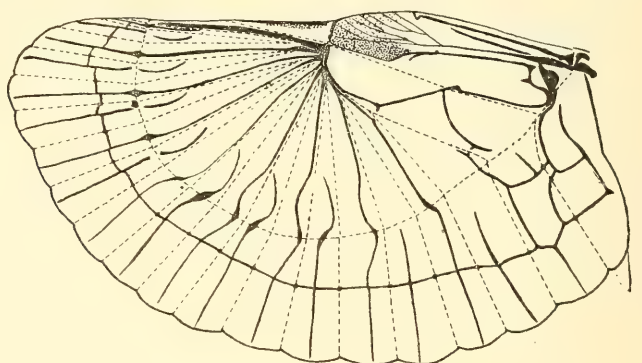


Figure 337. Venation and method of folding of the wing of an earwig.

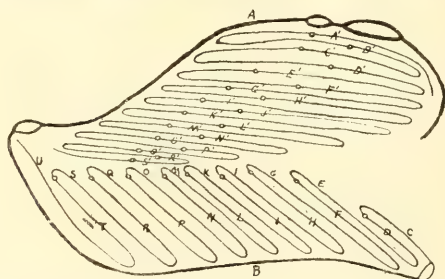


Figure 338. Section across the folded wing of an earwig. The numbers locate the areas shown in figure 337.

## CORRODENTIA.

Under the name Corrodentia are now assembled three very distinct groups evidently closely related but differing so in habits and structure as to seem to many to deserve rank as independent orders. The larger group usually designated as the Mallophaga, the biting bird lice, have very evidently been derived from the Psocina in rather recent times probably coincidently with their hosts. The termites are very ancient and are the only group in the order with abundant fossil remains, the others being of too small size and delicate structure.

### SYNOPSIS OF FAMILIES.

**Phlopteridæ:** antennæ five-jointed.

**Liotheidæ:** antennæ concealed, four-jointed. **Gyropidæ:** feet with one claw.

**Trichodectidæ:** antennæ three-jointed.

**Termitidæ:** feet four-jointed. **Embiidæ:** thoracic segments as long as broad

**Psocidæ.** **Atropidæ:** no ocelli.

### PHILOPTERINA.

The bird lice are as a rule confined to one or a few related host species. The following list gives the hosts of the California species.

**Grebe** *Docophorus lari*, *pertusus*. **Menopon** *tridens* **Nirmus** *fuscomarginatus*. **Loon** *Docophorus columbinus*, *graviceps*, *lari*. **Lipeurus** *faralloni*. **Menopon** *tridens*. **Puffin** *Colpocephalum perplanum*. **Nirmus** *pacificus*. **Auklet** *Docophorus acutipectus*, *atricolor*, *montereyi*. **Nirmus** *maritimus*. **Murrelet** *Docophorus atricolor*, *montereyi*. **Guillemot** *Docophorus procax*. **Nirmus** *fuscomarginatus*, *pacificus*. **Murre** *Docophorus calvus*. **Jaeger** *Docophorus melanocephalus*. **Nirmus** *triangularis*. **Lipeurus** *laculatus*. **Kittiwake** *Docophorus lari* **Nirmus** *lineolatus*. **Gull** *Colpocephalum funebri*. *Docophorus lari*. **Menopon** *infrequens*. **Nirmus** *felix*, *lineolatus*. **Tern** *Docophorus melanocephalus*. **Menopon** *tridens* **Nirmus** *hebes*, *præstans*. **Albatros** *Colpocephalum pingue*. *Eurymetopus brevis*.

*Gibelia mirabilis*. *Lipeurus concinnus*, *densus*, *diversus*, *ferox*. *Menopon ir-rumpens*, *navigans*. *Nirmus gigantica*. **Fulmar** *Ancistroma gigas*. *Docophorus occidentalis*. *Eurymetopus brevis*. *Lipeurus celer*, *varius*. *Menopon numerosum*. *Nirmus maritimus*. **Shearwater** *Ancistroma gigas*. *Docophorus validus*. *Eurymetopus brevis*. *Gibelia mirabilis*. *Lipeurus diversus*, *fuliginosus*, *laculatus*, *limitatus*, *testaceus*. *Menopon paululum*, *petulans*. *Nirmus gigantica*, *pacificus*. **Cormorant** *Lipeurus Faralloni*, *toxoceros*. *Menopon titau*. *Pelican Colpocephalum unciferum*. *Lipeurus bifasciatus*, *furculatus*, *toxoceros*. *Menopon consanguinium*, *titan*. **Merganser** *Docophorus icteroides*. *Lipeurus squalidus temporalis*. *Trinoton lituratum*, *luridum*. **Duck** *Docophorus icterodes*. *Lipeurus constrictus*, *squalidus*. *Menopon loomisii*. *Trinoton lituratum*, *luridum*. **Rail** *Menopon tridens* *Oncophorus bisetosus*. **Coot** *Docophorus gräviceps*, *minuto-trabeculatus*, *pertusus*, *quadriceps*. *Læmobothrium atrum*. *Lipeurus longipilus*, *luridus*, *picturatus*. *Menopon tridens*. *Oncophorus advena*, *minutus*. **Phalarope** *Nirmus furvus*. **Sandpiper**. *Docophorus fusiformis*. *Nirmus complexivus*. **Sanderling** *Colpocephalum spinulosum*. *Nirmus actophilus*, *complexivus*. **Godwit** *Nirmus cordatus*. **Plover** *Colpocephalum timidum*. *Docophorus fuliginosus*. *Nirmus opacus*. **Partridge** *Goniodes mammillatus* *Lipeurus docopheroides*. **Grouse** *Lipeurus perplexus*. *Goniodes mammillatus*. **Ptarmigen** *Goniodes mammillatus*. **Chicken** *Goniocotes abdominalis*. *Menopon biseriatum*, *pallidum*. **Pheasant** *Gosiocotes creber*. **Kite** *Colpocephalum flavescens*, *osborni*. *Menopon decoratum* *Nirmus fuscus*. **Hawk** *Colpocephalum flavescens*. *Nirmus fuscus*. **Eagle** *Colpocephalum flavescens*. *Docophorus pictus*. **Owl** *Docophorus cursor*, *rostratus*, *speotyti*. **Woodpecker** *Docophorus californiensis*, *singularis*. *Menopon funereum*. **Sapsucker** *Docophorus californiensis*. **Flicker** *Lipeurus macrocephalum*. **Hummingbird** *Nirmus eustigmus*, *vulgatus*. *Physostonum*. **Kingbird** *Nirmus fœdus*. **Flycatcher** *Docophorus communis*, *fuscovenalis*, *rufus*. *Menopon distinctum*. *Nirmus fœdus*, *vulgatus*. *Physotomum sucinaaceum*. **Phœbe** *Nirmus fœdus*. **Lark** *Docophorus communis*. **Jay** *Docophorus communis* *Nirmus vulgatus*. *Menopon persignatum*. **Raven** *Colpocephalum subæquale*. **Crow** *Menopon mesoleucum*. **Blackbird** *Docophorus communis*. **Meadowlark** *Docophorus communis*. **Oriole** *Docophorus Communis*. **Grosbeak** *Menopon funereum*. **Finch** *Docophorum communis*. *Menopon incertum*. *Nirmus vulgatus*. *Physotomum microcephalum*. **Longspur** *Docophorus communis*. **Sparrow** *Docophorus communis*. *Menopon incertum*, *mœstum*. *Nirmus latiusculus*, *vulgatus*. *Physotomum diffusum*. **Junco** *Docophorus communis*. *Nirmus vulgatus*. **Songsparrow** *Colpocephalum chrysophæum*, *grandiculum*. *Docophorus communis*. *Menopon mœstum*. **Towhee** *Colpocephalum grandiculum*. *Docophorus communis*. *Nirmus vulgatus*. **Cardinal** *Docophorus communis*. **Bunting** *Nirmus vulgatus*. **Tanager** *Docophorus communis*. **Swallow** *Menopon mallens*. *Nirmus longus*. **Waxwing** *Docophorus communis*, *incisus*. *Nirmus brachythorax*. **Phainopepla** *Nirmus fœdus*. **Shrike** *Docophorus communis*. *Nirmus fœdus*. **Warbler** *Docophorus communis*. *Menopon ridulosum*. *Nirmus vulgatus*. **Chat** *Nirmus fœdus*. **Dipper**

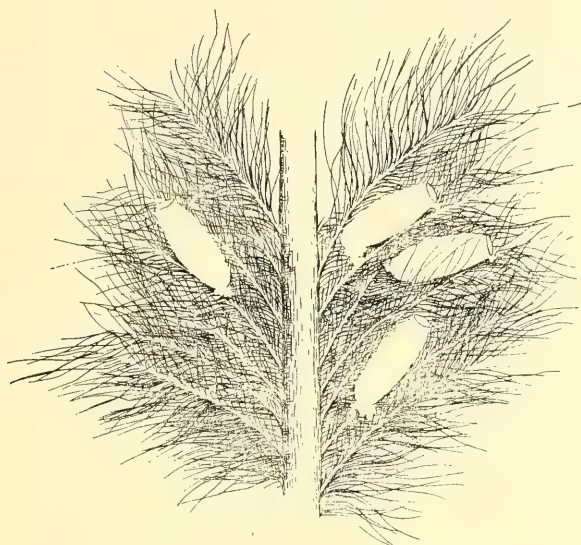


Figure 339. Eggs of *Menopon pallidum*.

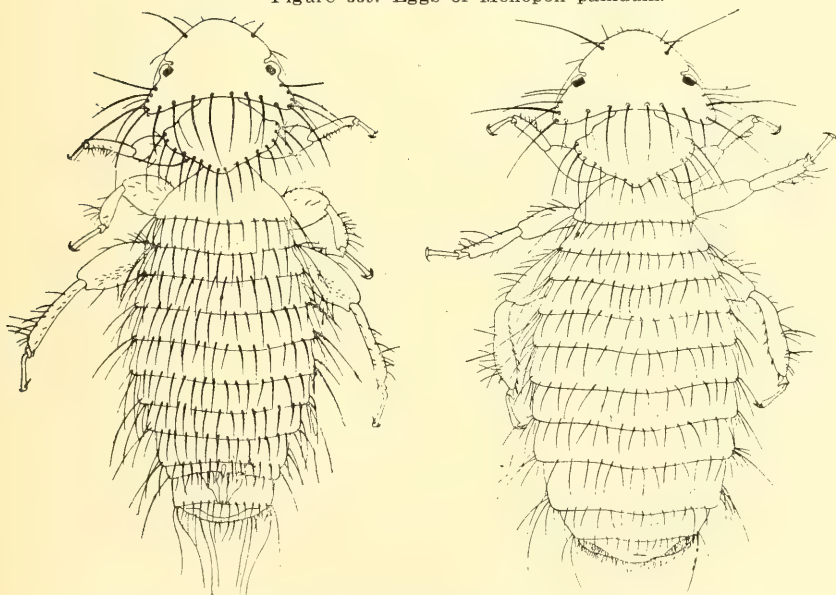


Figure 340 A chicken louse *Menopon pallidum*. The two sexes.



*Nirmus vulgatus*. **Thrasher** *Docophorus communis*. **Wren** *Docophorus communis*, *mirus*. **Menopon distinctus**, *incertum*, *malleus*. **Titmouse** *Docophorus communis*. **Chicadee** *Nirmus vulgatus*. **Bushtit** *Colpocephalum fumidum*. **Menopon robustum**. **Robin** *Docophorus communis*. *Nirmus vulgatus*. **Bluebird** *Docophorus Communis*, *incisus*. **Fox** *Trichodectes quadraticeps*. **Pocket gopher**. *Trichodectes geomydis*. **Skunk** *Trichodectes mephitidis*.

## LITHEIDÆ.

## SYNOPSIS OF GENERA.

**Menopon**: eyes not in hollows. **Physotomum**: sides of head straight. **Ancistrona**: length over 5 m.m.

**Colpocephalum**. **Trinoton** and **Læmobothrum**: forehead with lateral swellings, the last with meso and metathorax fused.

**Ancistrona gigas** Piag.

**Colpocephalum chrysophæum** Kel.

*epinulosum* Piag.

*flavescens* Nitz.

*fumidum* Kel.

*funebre* Kel.

*grandiculum* Kel.

*numerosum* Kel.

*osborni* Kel.

*perplanum* Kel.

*pingue* Kel.

*spinulosum* Piag.

*strictum* K.&P.

*subæquale* Nitz.

*ridulosum* K.&C.

*robustum* Kel.

*titian* Nitz.

*timidum* Kel.

*unciferum* Kel.

**Menopon biseriatum** Piag.

*consanguineum* Piag.

*decoratum* Kel.

*distinctum* K.&C.

*funereum* K.&C.

*incertum* Kel.

*infrequens* Kel.

*irrupens* K.&C.

*loomisii* Kel.

*malleus* Nitz.

*mesoleucum* Nitz.

*mæstum* K.&C.

*numerosum* Kel.

*navigans* Kel.

*monstœchum* Kel.

*pacificum*—*tridens*.

*palulum* K.&C.

*persignatum* Kel.

*petulans* K.&C.

*tridens* Nitz.

**Trinoton lituratum** Nitz.

*luridum* Nitz.

**Læmobothrium atrum** Nitz.

**Physotomum diffusum** Kel.

*microcephalum* Kel.

*prominans* K.&C.

*sucinaceum* Kel.

## TRICHODECTIDÆ.

**Trichodectes geomydia** Osb.

*mephitidis* Osb.

*quadriceps* Chap.

## PHILOPTERIDÆ.

## SYNOPSIS OF GENERA.

**Lipeurus**: body narrow. **Nirmus**: antennæ alike in both sexes. **Oncophorus**: legs short.

**Docophorus**. **Eurymetopus**, **Gonioides** and **Goniocotes**: with antennæ unlike in the sexes, the first with the last abdominal segment emarginate, the second with an appendage on third antennal segment. **Giebelia**: with membranous appendage on forehead.

**Docophorus acutipectus** Kel.

*atricolor* Kel.

*californiensis* Kel.

*calvus* Kel.

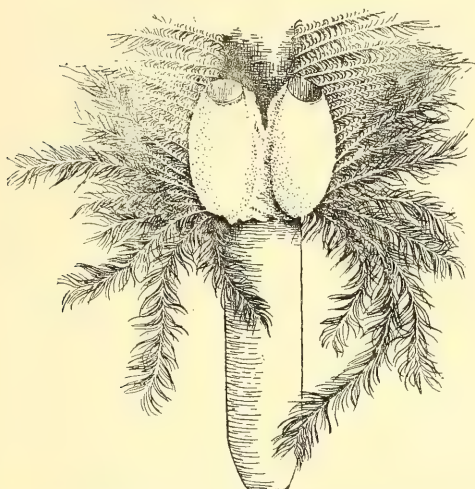


Figure 341. Eggs of *Goniocotes abdominalis*.

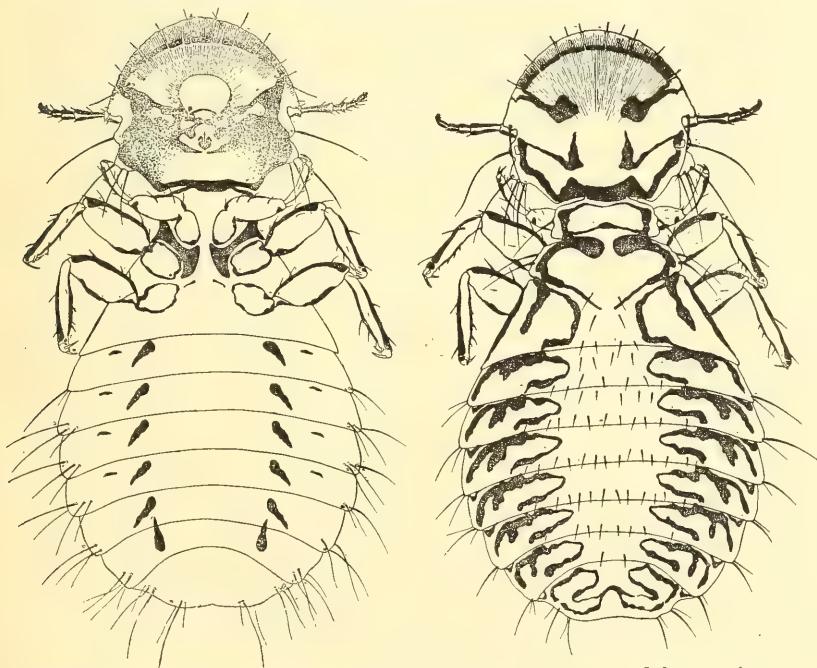


Figure 342. A chicken louse *Goniocotes abdominalis* upper and lower view.

- columbinus* Den.  
*communis* Nitz.  
*cursor* Nitz.  
*fusiformis* Den.  
*fuliginosus* Kel.  
*fuscoventralis* Osb.  
*gigantula* Kel.  
*graviceps* Kel.  
*Icterodes* Nitz.  
*incisus* Kel.  
*lara* Den.  
*langus* Kel.  
*melanocephala* Burm.  
*mirinotatus* K.&C.  
*mirus* Kel.  
*monachus*—*pertusus*.  
*montereyi* Kel.  
*occidentalis* Kel.  
*pertusus* Nitz.  
*pictus* Gieb.  
*platyrhynchus* Nitz.  
*procax* K. & C.  
*rostratus* Nitz.  
*rufus* Kel.  
*singularis* K.&C.  
*speotyti* Osb.  
*validus* K.&C.  
*Eurymetopus brevis* Duf.  
*Giebelia mirabilis* Kel.  
*Goniocotes abdominalis* Piag.  
     *creber* Kel.  
*Goniodes curvicornis* Gieb.  
     *mammilatus* Rud.  
*Lipeurus californicus*—*docophoroides*.  
     *celer* Kel.  
     *concinus* Kel.  
     *constrictus* Kel.  
     *densus* Kel.  
     *diomedea* Fabr.  
     *diversus* Kel.  
     *docophoroides* Piag.  
     *faralloni* Kel.  
     *ferox* Gieb.  
     *forficulatus* Nitz.  
     *fuliginosus* Tash.  
     *gracilicornis* Piag.  
     *laculatus* Kel.  
     *limitatus* Kel.  
     *longipilis* Kel.  
     *macrocephalus* Kel.  
     *perplexus* Kel.  
     *snodgrassi* Kel.  
     *squalidus* Nitz.  
     *temporalis* Nitz.  
     *testaceus* Tasch.  
     *toxocerus* Nitz.  
     *varius* Kel.  
*Nirmus actophilis* K.&C.  
     *americanus*—*fuscomarginatus*.  
     *brachythorax* Gieb.  
     *complexus* K.&C.  
     *cordatus* Osb.  
     *ductilis* K.&C.  
     *eustigmus* Kel.  
     *felix* Gieb.  
     *fœdus* K.&C.  
     *fuscomarginatus* Den.  
     *furvus* Nitz.  
     *fuscus* Nitz.  
     *gigantula* Kel.  
     *hebes* Kel.  
     *incœnis* K.&C.  
     *latiusculus* K.&C.  
     *lineolatus* Nitz.  
     *longus* Kel.  
     *maritimus* K.&C.  
     *opacus* K.&C.  
     *pacificus* Kel.  
     *præstans* Kel.  
     *punctatus* Nitz.  
     *triangularis* Nitz.  
     *vulgatus* Kel.  
*Oncophorus advena* Kel.  
     *bisetosus* Piag.  
     *californicus*—*bisetosus*.  
     *minutus* Nitz.

## TERMITINA.

### TERMITIDÆ.

In the tropics the termites or white ants easily take first place as insect pests but here in California they are rarely more than objects of interest because of their habits, particularly the annual flight of the winged forms and the great numbers of discarded wings to be seen at the close of the day.

Very little is known of the colony life of our species. One will often find

colonies in rotten logs or in the ground. The queen probably lives in the ground as she is never seen in the infested log when that is torn to pieces to study the colony.

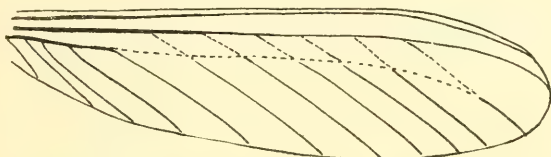


Figure 343. Diagram of the venation of the white ants.

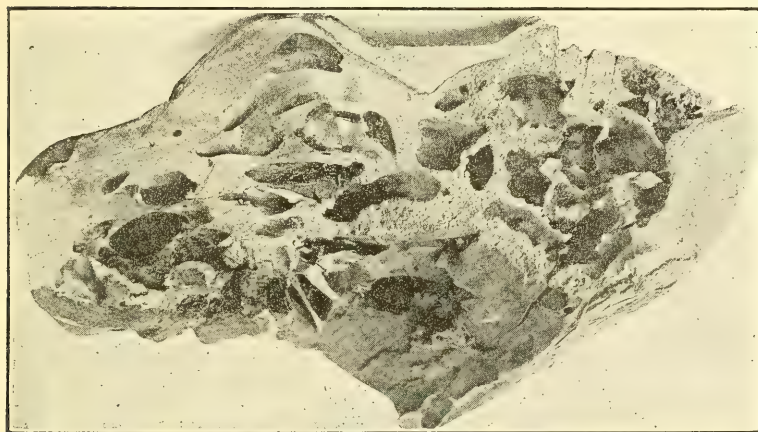


Figure 344. Work of a white ant.

*Callotermes castaneus* Burm.  
*marginipennis* Latr.  
*Termes flavipes* Kol.  
*lucifugus* Ros.  
*angusticollis*—*Termopsis*.

*castaneus*—*Callotermes*.  
*marginipennis*—*Callotermes*.  
*Termopsis angusticollis* Walk.  
*occidentalis* Walk.

#### EMBIIDÆ.

*Embia californica* Banks.

#### PSOCINA.

#### ATROPIDÆ.

*Leptinotus piceus* Mots.



## PSOCIDÆ.

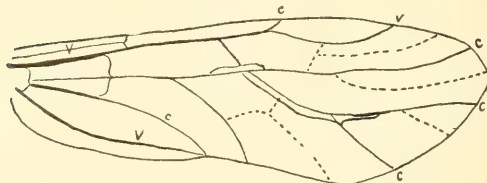


Figure 345. Diagram of the venation of the Psocidæ.

*Elipsochus punctatus* Banks.  
*Myopsochus maculosus* Banks.

*Cæcilius aurantiacus* Hag.  
*clarus* Banks.

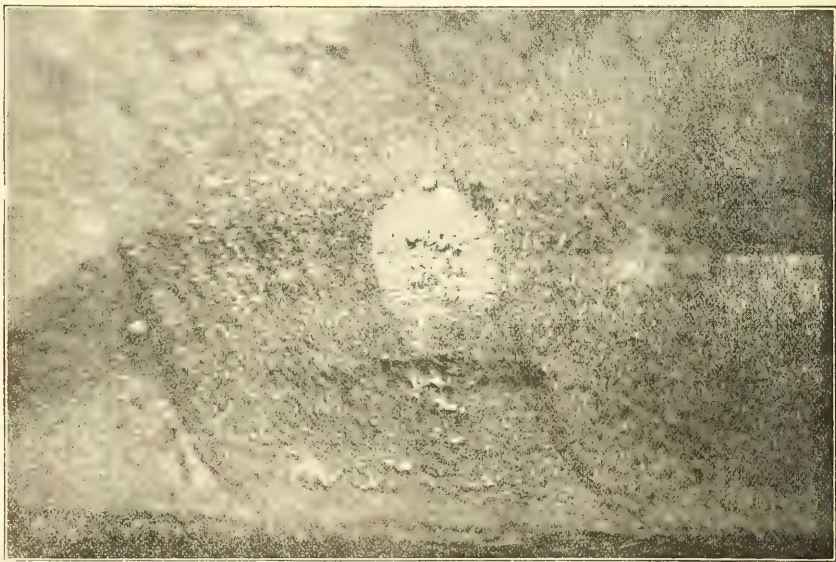


Figure 346. The egg tent of a Psocid.

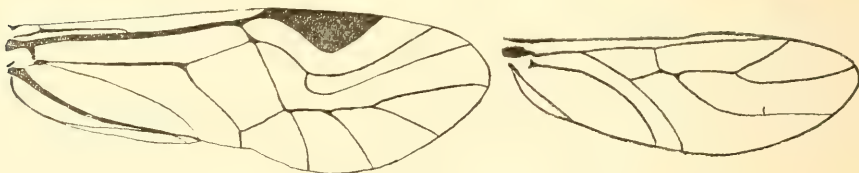


Figure 347 Venation of a Psocid.



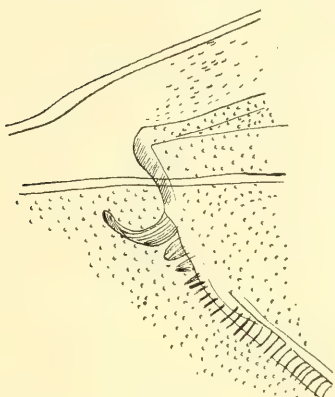


Figure 348. Hook on the wing of  
a psocid.

## EPHEMERIDA.

The mayflies are not well represented in California. The nymphs are aquatic. Their venation shows perhaps the largest number of veins found among insects. In this and the following order the wings are rigidly attached to the wing root and the musculature of the thorax is different from that of preceeding orders.

### EPHEMERIDÆ.

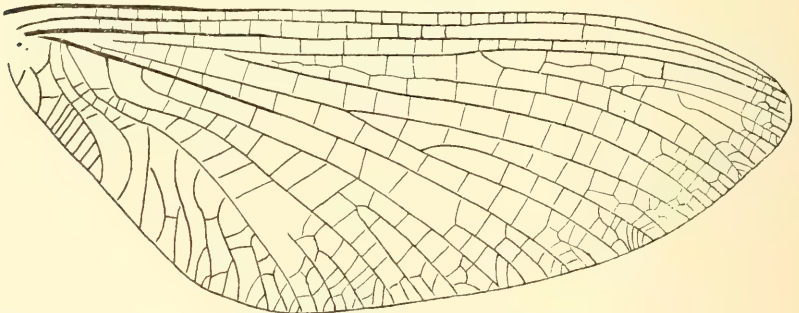


Figure 349 Venation of a mayfly

*Ameletus exquisitus*—*Siphylurus*.

*Bætisca obesa* Say.

*Bætis obesa*—*Bætisca*.

*Callibætis californicus* Banks.

*hageni*—*tessellatus*.

*pictus*—*undulatus*.

*tessellatus* Hag.

*undulatus* Pict.

*Heptagenia nitidus* Eat.

*Iron nitidus*—*Heptagenia*.

*Leptophlebia rufivenosus* Eat.

*Siphylurus dissitus* Eat.

*exquisitus* Eat.

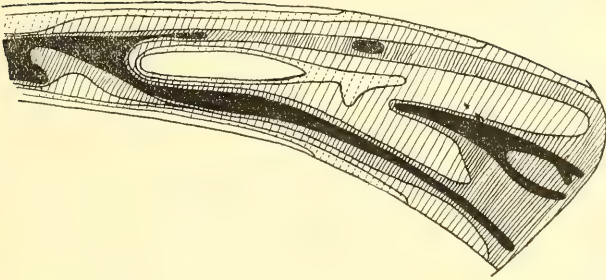


Figure 350. Diagram showing variation of surface level in a mayfly wing.

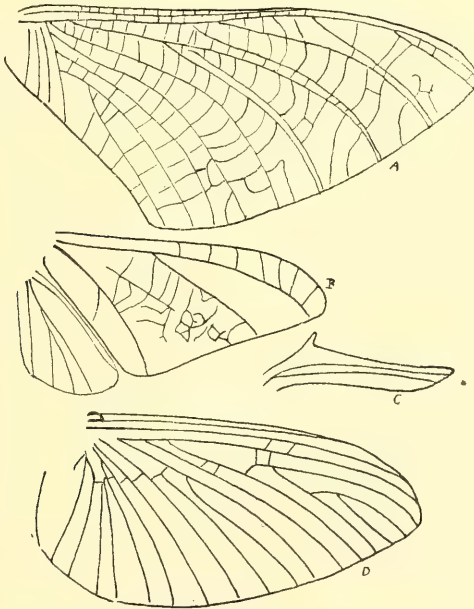


Figure 351. Unusual venations of mayflies.

## ODONATA.

These insects are carnivorous both as young and adults. The nymphs are aquatic and notable on account of the greatly developed under lip, which has become a grasping organ for securing their prey. The adults are familiarly known as "dragonflies" "darning needles" "snake feeders or doctors." There are seven families the last two being sometimes distinguished as damselflies

### SYNOPSIS OF FAMILIES.

**Agrionidæ:** eyes hemispherical. **Calopterygidæ:** five or more antecubitals.

**Libellulidæ:** antecubitals corresponding. **Cordulidæ:** eyes tubercled behind.

**omphidæ.** **Æschnidæ:** eyes approximate. **Corduligasteridæ:** touching at but a single point.

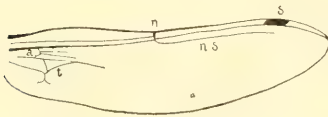


Figure 352. Diagram of the wing of Odonata. a. arculus. n. node. n.s. nodal sector. s. stigma. t. triangle.

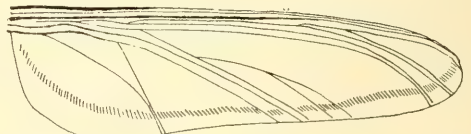


Figure 353. Diagram of the venation of fossil dragonflies.

### LIBELLULIDÆ.

*Belona odiosa*—**Libellula**.  
*saturata*—**Libellula**.  
*Diplax corrupta* (Hag.)  
*flavocosta*—**mandida**.  
*hageni* Cal.  
*mandida* Hag.  
*semicincta* (Say.)  
*Lepetrum corrupta*—**Diplax**.  
*forensis*—**Libellula**.  
*Libellula forensis* Hag.  
*longipennis*—**Pachydiplax**.  
*lydia* Dru.  
*odiosa* Hag.

*pulchella* Dru.  
*saturata* Uhl.  
*semicincta*—**Diplax**.  
*simplicicollis*—**Mesothemis**.  
*subornata* Hag.  
*Mesothemis collocata*—**simplicicollis**.  
*illecta* Hag.  
*longipennis*—**Pachydiplax**.  
*simplicicollis* (Say.)  
*Platythemis subornata*—**Libellula**.  
*trimaculata*—**Libellula**.  
*Pachydiplax longipennis* Burm.





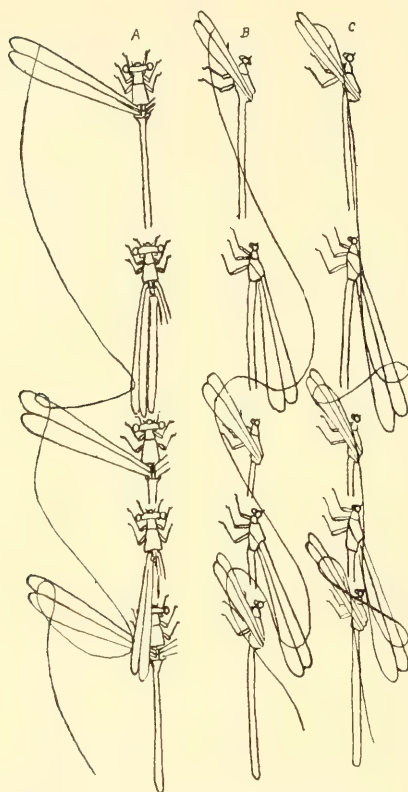


Figure 355. Diagram illustrating the flight of *Agrion*. A. From above, the curved line showing the path of the stigma. B. From the side, according to the theory of von Lendenfeldt. C. From the side, according to the theory of Marey.

## NEUROPTERA.

The order Neuroptera is very frequently divided on the basis of metamorphosis, and the two or three preceding orders have been combined with part or all of the order. Each of the superfamilies is sometimes considered a distinct order.

### SYNOPSIS OF FAMILIES.

Myrmeleonidæ: antennæ enlarged at tip.

**Sericostomatidæ:** wings clothed with hair. **Limnephilidæ:** legs spiny.

**Leptoceridae, Rhyacophilidae and Hydropsychidae:** male palpi five-jointed, the first two with last joint elongate, the second with the basal joint of antennae long.

**Chrysopidæ:** prothorax distinctly wider than long. **Hemerobiidæ:** antennal joints beadlike.

**Raphidiidæ:** prothorax much longer than wide.

**Panorpidæ:** mouth at end of long trunk.

**Sialidæ.** **Perlidæ:** feet three-jointed. **Mantispidæ:** front legs much enlarged. **Coniopterygidæ:** body and wings covered with a white powder.

*PHRYGANINA.*

## RIACOPHILIDÆ.

*Agapetus celatus* McL.                      *basalis* Banks.

*Riacophila angelita* Banks.

PSYCHOMYIDÆ.

*Tinodes consueta* McL.

## HYDROPSYCHIDÆ.

*Diplectrona nigripennis* Banks. . . . . *Hydropsyche californica* Banks.

ODONTOCERIDÆ.

*Neurophilus californicus* Hag.  
*plutonius* Banks.      *Silo californicus*—*Neurophilus*.

## SERICOSTOMATIDÆ.

- Helicopsyche californicum* Banks.                      *nigricula* McL.  
*Lopodostoma cinereum* BaBnks.                      *Silo californicus* Hag.  
*Nosopus podiger* McL.                                      *cinereus*—*Lepidostoma*.  
*Notidobia griseola* McL.

## CALAMOCERATIDÆ.

- Heteroplectron californicum* McL.

## LIMNEPHILIDÆ.

- Limnephilus gravidus* Hag.                                      *occidentalis*—*designatus*.  
*Platyphylax designatus* Walk.

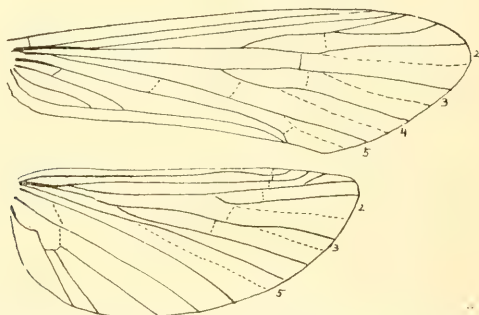


Figure 356. Venation of the larger Phryganeidæ.

## PANORPINA.

## PANORPIDÆ.

This family includes the scorpion flies, so called because the abdomen in some cases mimic the sting of a scorpion. The larvæ live in the ground and both larvæ and adults are carnivorous.

- Bittacus apterus* McL.                                      *Boreus californicus* Pack.  
*chlorostigma* McL.

## HEMEROBINA.

## CHRYSOPIDÆ.

The lace wing flies feed on aphids. The eggs which are laid on long stalks are conspicuous objects on the leaves of aphid infested trees.

- Eremochrysa californica* Banks.                      *gravida* Banks.  
    *marginalis* Banks.  
*Chrysopa californica* Coq.                                      *punctinervis*—*Eremochrysa*.  
    *externa* Hag.                      *Nothochrysa californica* Banks.



Figure 357. *Chrysopa* larva.

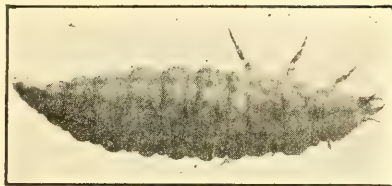


Figure 360. *Hemerobius* larva

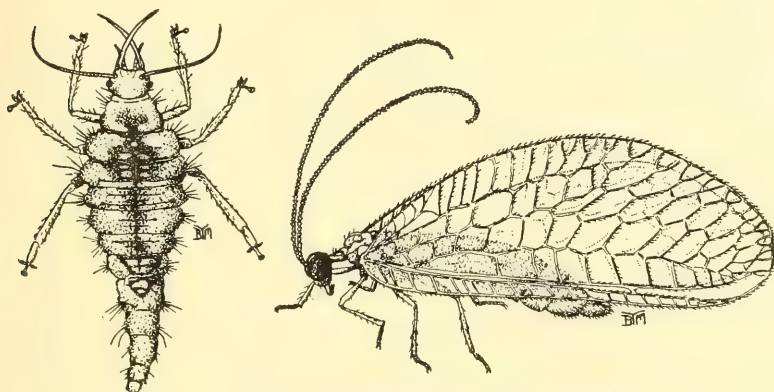


Figure 358. Green Lacewing, *Chrysopa californica*.

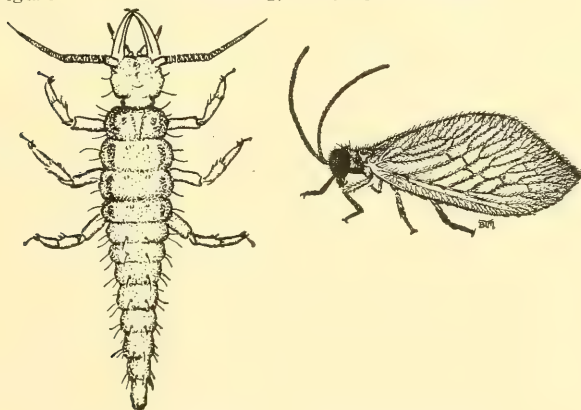


Figure 359. Brown Lacewing. *Hemerobius pacificus*.

## HEMEROBIDÆ.

The larvæ of these insects cover the body with excrement and rubbish. They feed on plantlice.

*Boriomyia coloradensis* Banks.

*Hemerobius mœstus* Banks.

*Polystœchotes punctulatus* Fabr.  
*pacificus* Banks.

*tutatrix* (not California.)

*Symphorobius angustus* Banks.  
*californicus* Banks.

## MYRMELEONIDÆ.

These are the antlions or as the children usually call them "doodle bugs"

The larvæ make conical pitfalls in the sand and lie buried at the bottom of the burrow till some insect falls in the pit and then they grasp it, pull it under the sand and proceed to suck its blood.

*Acanthaclisis fallax* (Ramb.)

*Brachynemurus coquilletti* Cur.

*exitalis* (Walk.)

*ferox* (Walk.)

*longipalpus* Hag.

*maculosus* BBanks.

*minusculus* Banks.

*peregrinus*—Myrmeleon.

*quadripunctatus* Cur.

*Dendroleon obsoletum* (Say.)

*sackeni* Hag.

*Formicalio obsoletum*—*Dendroleon*.

*Maracandula bellula* Banks.

*Myrmeleon distans* Banks.

*exitialis*—*Brachynemurus*.

*fallax*—*Acanthaclisis*.

*ferox*—*Brachynemurus*.

*immaculatus* Dru.

*peregrinus* (Hag.)

## CONIOPTERYGIDÆ.

Small insects with wings covered with a white powder. The larvæ feed on the eggs of red spiders, puncturing them and lapping out the contents

*Coniwentzia hageni* Banks.

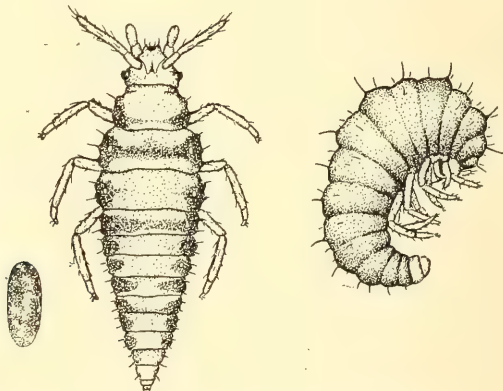


Figure 361. *Coniwentzia hageni*, Eggs, larva, pupa.

## MANTISPIDÆ.

Carnivorous insects living on vegetation and capturing rather large prey.  
*Symphasis signata* Hag.



## RAPHIDIDÆ.

These insects are carnivorous, living in the ground as larvæ and in the grass as adults.

*Inocellia hageni* Alb.  
*inflata* Hag.  
*longicornis* Alb.  
*Raphidia adnixa* Hag.

*astuta* Banks.  
*distincta* Banks.  
*cblita* Hag.  
*occulata* Banks.

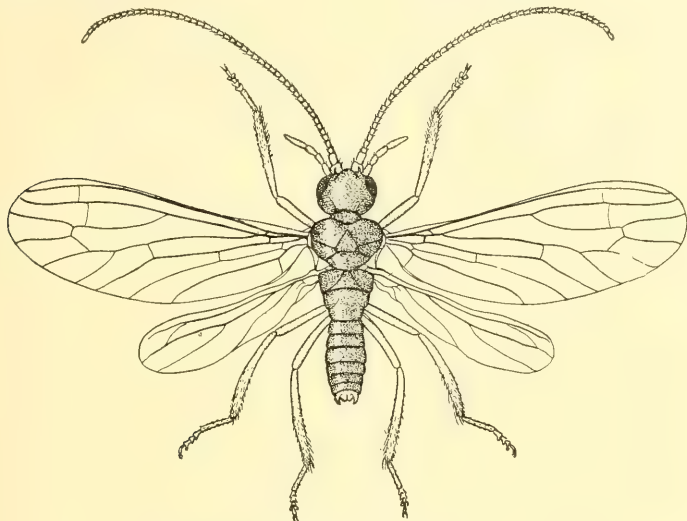


Figure 362. *Conventzia hageni*.

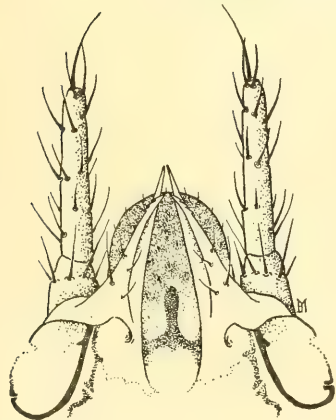


Figure 364. *Conventzia hageni*. Mouth-parts of adult.

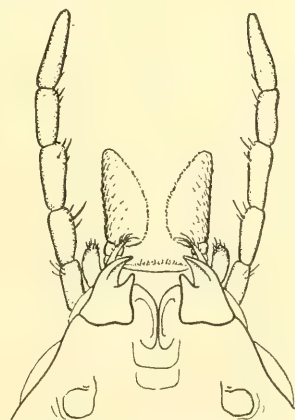


Figure 363. *Conventzia hageni*. Mouth-parts of larva.

## SIALIDÆ.

The larvæ are aquatic and carnivorous.

*Chauliodes californicus* Walk.  
    *disjunctus* Walk.  
    *minimus* Dav.

*Sialis fuliginosa* Pict.  
    *infumata* Newm.  
    *nevadensis* Dav.

## PERLINA.

## PERLIDÆ.

Aquatic insects in their early life living beneath stones, etc., at the bottom of streams and ponds and feeding on decaying vegetable matter.

*Alloperla continua* Banks.

*concolor* Banks.

*Dictyopteryx signata* Hag.

*Pteronarchus californicus* Newp.

*Perla californica* Banks.

*proteus* Newm.

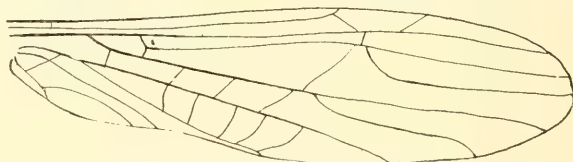


Figure 365. Venation in *Nemoura*.

## APTERA.

The members of this order are mostly insects of very small size living in damp situations and feeding on decaying vegetable matter.

### SYNOPSIS OF FAMILIES.

**Entomobriidæ:** abdomen with ventral tube on first segment. **Lipuridæ:** legs very short. **Smynthuridæ:** segments of abdomen obscure.

**Lepismidæ.** **Campodeidæ:** middle tail feeble or wanting. **Machilidæ:** outer tails shorter. **Japygidæ:** with pincers instead of tails.

#### SMYNTHURIDÆ.

Papirus maculosus Sch.	luteus Lub.
Smynthurus albipes Sch.	niger—albipes.
eisenii Sch.	plicatus Cch.

#### LIPURIDÆ.

This family includes the smallest members of the order. They often become extremely abundant in the soil and after rains are often found floating on pools as a film completely covering the surface.

Achorutes armatus Nic.	Lipeura inermis Tull.
viaticus (Linn.)	Xenella maritimus (Fabr.)

#### ENTOMOBRIIDÆ.

These are very common insects found most frequently at the surface of the ground under stones, fallen leaves, etc., particularly in moist situations. On cloudy days they may often be seen abundantly running over leaves of grass and other plants. In greenhouses and damp gardens they sometimes become real pests, gnawing off the surface of the leaves and showing a decided preference for the petals of flowers.

Podura maritimus—Xenella.	marginata (Tul.)
viaticus—Achorutes.	multifasciata (Tul.)
Degeeria marginata—Entomobria.	nivalis (Linn.)
multifasciata—Entomobria.	sexoculata Sch.
Drepanura californica Sch.	Isotoma balteata—palustris.
Entomobria atrocincta Sch.	fimataria (Linn.)
binoculata Sch.	lacustris Sch.
cœca Sch.	palustris (Mul.)
curviseta Bro.	viridis (Mul.)

*Orchesella rufescens* (Linn.)

*Podura fimitaria*—*Isotoma*.

*nivalis*—*Entomobria*.

*palustris*—*Isotoma*.

*rufescens*—*Orchasella*.

*viridis*—*Isotoma*.

*Siera purpurea* Sch.

*Templetonia quadroculata* Sch.

*Tomocerus niger* Bour.

*Evalljapyx diversipleura* Sil.  
*propinquus* Sil.

#### JAPYGIDÆ.

*Japyx diversiunguis* Sil.

*Machilis aurantiacus* Sch.

#### MACHILIDÆ.

*Iepisma reticulata* Sch.

#### LEPISMIDÆ.

*Campodea staphylinus* Westw.

#### CAMPODIDÆ.

## APPENDIX.

The preceding pages deal very largely with the classification of insects. To the majority of students the identification of an insect is simply for the purpose of finding the literature of the insect in question. The science of entomology is much broader. Below will be found suggestions and helps for the study of insects from a somewhat broader view point.

### COLLECTING INSECTS.

Every student in entomology is urged to make a collection of insects, both for the purpose of securing material for the study of classification which every one should understand, and for the purpose of securing first hand

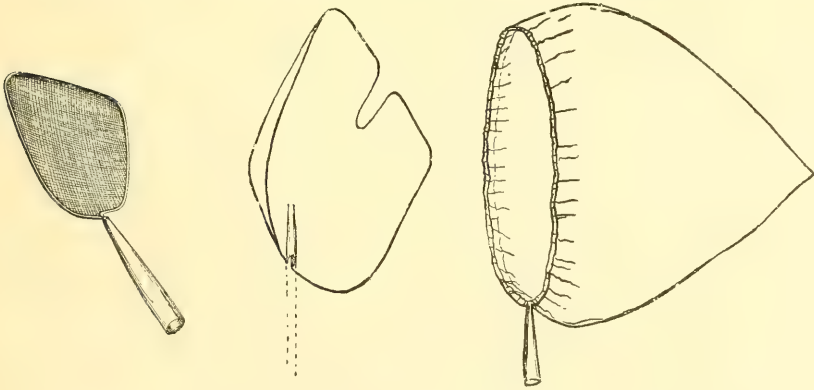


Figure 357. Sweep net, beating net and water net.

information concerning their habits and mode of life. One will find insects almost everywhere, and many can be secured and preserved without the use of any special equipment. Papers for holding insects are usually folded into



triangles as follows: For the larger Lepidoptera and Odonata use a piece of paper the shape and size of a page of this book, folding it obliquely across the middle, doubling over the projecting ends and turning the corners over again making a triangular envelope. One side is now opened, the insect inserted and then it is closed up again and the two acute angles are twisted over and pinched together effectively sealing the envelope. For most butterflies and other insects a sheet of paper a half, a quarter or even an eighth the size of this page would be used. Insects liable to injure themselves in the paper may be killed by a drop of gasoline, benzine, chloroform or ether which will soak thru the paper, or the envelope may be held for a moment over a flame, heat being very quickly fatal to all insects. The common gelatin to be had at any drug store is one of the most satisfactory containers for specimens of insects and should be regularly carried in the pockets of every collector.

On collecting trips a net and a cyanide bottle are almost always carried by insect collectors. A butterfly net is usually made of mosquito netting or some similar fabric, made bag-shaped and two or three times as deep as the diameter. The best nets for sweeping and general collecting is a conical bag about a foot in diameter and a foot and a half to two feet deep. A special shallow net, preferably of wirecloth. Electric lights or any kind of this net is an extension at the tip of the bag to hold a quarter pound paper bag, a narrow sleeve on the inside fits into the paper bag and the insects are driven into this bag by the motion of the net. The paper bags are replaced as fast as they are filled and the insects brought in alive or placed bag and all in a large cyanide jar. The particular advantage of this net is the good condition of the insects even when captured in wet grass.

The net hoop may be made by bending a piece of wire into a hoop, the two ends being bent out at right angles so as to lie adjacent and parallel with each other. These ends are then inserted into the small end of a six-inch tin ferrule and soldered fast. This ferrule may serve as a handle or fitted over the end of a handle and held in place by a tack.

The cyanide bottle is by far the most convenient means of killing insects for the collection. A wide-mouthed bottle with an easily removed cork is charged with a small lump of cyanide, the vapor given off from which quickly kills any insect which may be enclosed.

The cyanide may be covered with wet plaster of paris, which sets at once holding the cyanide in place and preventing the insects from coming into direct contact with the poison, which might discolor them. The plaster may be put into the bottle dry and water added carefully so as to wet only a thin layer of the plaster, tamping it so as to leave no cavities. This dries quicker and is more easily removed when it is desired to recharge a bottle. In either case the bottle must be thoroly dried before using and redried if it becomes wet, otherwise the specimens may be injured. Another method preferred by

some is to cover the cyanide with sawdust, excelsior, cotton, crumpled paper or any material which will absorb the moisture and hold the cyanide in place, and cover with a piece of cardboard cut so as to fit tight in the bottle. To insure its holding in position, some fasten the edges with shellac or collodion or some other material not affected with moisture.

The use of the sweep net is the most prolific method of collecting. The method of sweeping is simply to swing the net back and forth so that the open mouth will strike across the tops of the grass or other plants. The end of the net quickly fills with rubbish in which a large assortment of insects will be found. They are usually not sorted out until after the insects are killed.

Flowers of many kinds furnish a rich source for specimens. One can use a net or catch many by hand or with a cyanide bottle. Under boards and stones and under the bark of logs and stumps are the richest places for hand collecting. Collecting in the water is often very prolific but requires a special shallow net, preferably of mirecloth. Electric lights or any kind of light is attractive to many insects that fly on warm evenings, and bait of molasses mixed with beer or other alcoholic liquor is also very attractive to night flying insects and is often made use of by insect collectors..

#### REARING INSECTS.

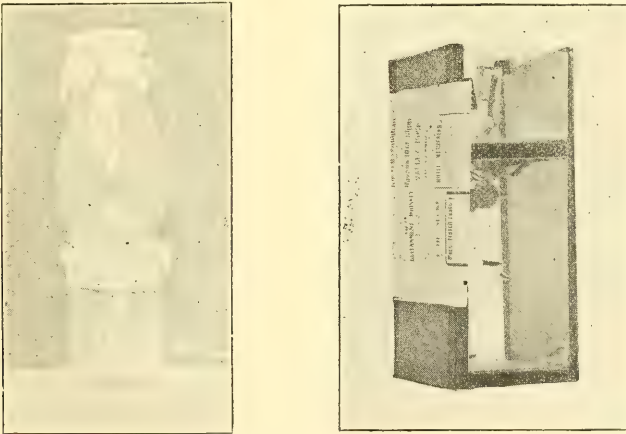


Figure 358. Paper box and lamp chimney cage.

The following out of the life history of insects requires the use of a cage. Cages may be made of all manner of shapes and sizes. Jelly glasses and chimneys of lamps or lanterns are very largely used. Some prefer paper boxes because the air never deposits moisture on the sides. It is distinctly best to keep the insects separate or with very few together and to use new or steril-



Figure 359. Bag cages on tree

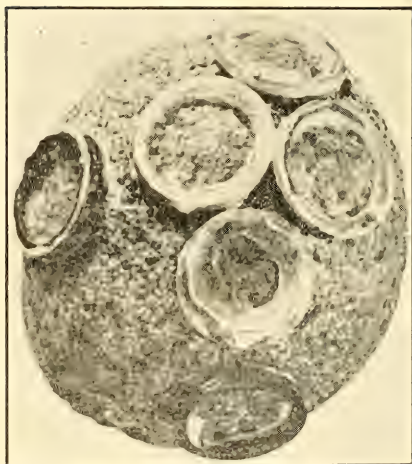


Figure 360. Cover glass cages on orange.

ized cages, because insects are sometimes subject to contagious diseases which are very fatal,

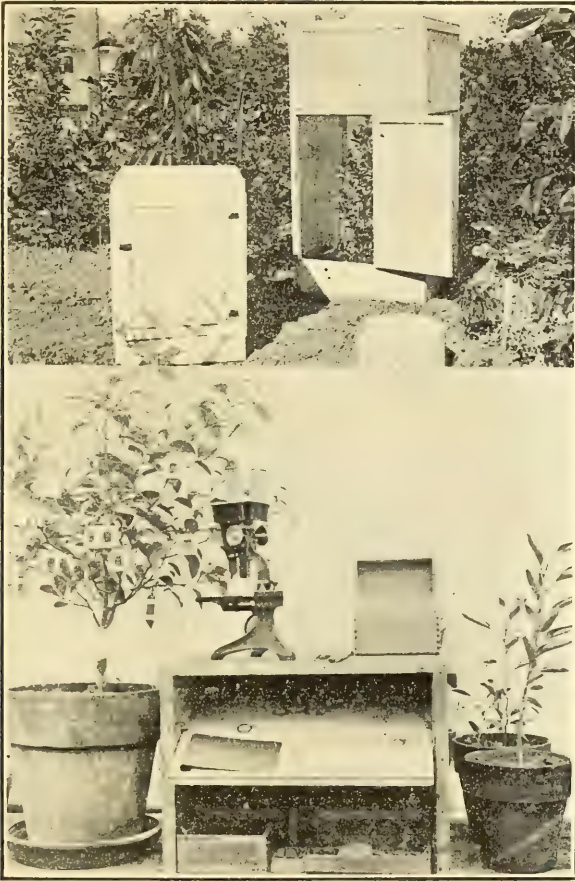


Figure 361. General view of an insetary.

Where practical a good plan is to cage the insect under normal conditions as for instance on its food plant. It is usually more convenient to assemble the insects being experimented with in one place, the insetary.

#### MOUNTING INSECTS.

All large insects should be pinned, using insect pins which should be in-



served in the thorax to the right of the median line and should emerge, in most cases between the middle and hind legs. One fourth of the length of the pin should be above the insect.

See that dirt that might render the study of the specimen difficult is removed. If the legs are retracted extend them and if the legs or antennæ are unusually long bring them up towards the body so that they may be in less danger of being broken off. Pull out the tongue in the case of bees that the palpi may be seen. It is generally desirable to attempt to determine any unknown insect at pinning time to learn what parts must be studied so that care may be taken to keep these exposed.

Small insects may be mounted by gluing them to the point of paper triangles. These should be not over 1 c.m. long nor over 2 m.m. wide at base. The under part of the left side just above the legs should receive the triangle point, the insect being at right angles to the triangle. Before beginning to mount a quantity of triangles should be cut and pinned ready for use.

Velvet mounts are undoubtedly the most convenient method for small insects. Cut white velvet into pieces one inch by three, lay a piece on a microscope slide pile up, arrange the specimens on the velvet and then lay another slide over them fastening the ends with gummed labels. Mount many specimens of each kind, both side up, and see that all significant structures are exposed. Other specimens may be added by breaking the seal at one end and carefully lifting the upper glass.

#### DRAWING.

The only way to effectively study complicated structures is by drawing them, and the first thing a student should learn is to draw accurately. Accuracy in drawing is almost wholly a question of learning to see and appreciate proportions. One sees the detail and if a feature of the detail is drawn first it will almost invariably be out of proportion. It will not look right but one is at loss to see wherein it fails to correctly interpret the object.

To draw a grasshopper side view for instance proceed as follows:

- 1st Decide and mark on the paper the total length of body.
- 2nd Draw the dorsal line locating the proportion the head, prothorax and elytra contribute to this line.
- 3rd Locate the main ventral line, comparing the width of the thorax with the dorsal length of the prothorax.
- 4th Locate the hind leg noting the position of the base by its direction from the hind angle of the pronotum, the angle at which it crosses the dorsal line, the length as compared with the elytra, and by the direction the tip of the leg lies from the tip of the wing.
- 5th Locate the divisions between the abdominal segments.
- 6th Now proceed to work in the detail, locating the minor points as needed in the same manner as above.



The above directions are sufficient for copying a drawing or for drawing a flat object but where the object has much depth, unless one be already a trained artist he should draw comparison sketches.

Comparison sketches are made of the same size but from a point of view ninety degrees apart. They are drawn in the manner just described, and compared by means of a series of parallel lines. Every point in each drawing should compare with the corresponding point in two adjacent figures.

When comparison drawings fail to agree the one in which the object is seen most nearly perpendicularly is likely to be the more accurate. In any case a careful inspection should show which drawing needs to be changed.

#### USE OF HAND LENS.

Insects are so small that the use of a magnifier is essential in their study and every student should be provided with a good pocket magnifier. A  $\frac{3}{4}$  inch (18 m.m.) or a  $\frac{1}{2}$  inch coddington is recommended as a good quality cheap lens and a triplet where one wants the best lens available. The fractional designation of lenses indicates the magnification. The normal focus of the eye is assumed to be ten inches (250 m.m.) and a lens that magnifies twenty times is called a  $\frac{1}{2}$  inch lens because the lens causes the rays from the object to enter the eye as tho the object were but half an inch away, the pupil remaining adjusted for the normal ten inch vision.

In selecting a lens avoid any showing serious aberration. Aberration is of two kinds, chromatic and spherical. Chromatic aberration may be detected by first putting the lens very close to a printed page and slowly withdrawing it. As the letters begin to lose their distinctness, more or less color will be seen around them. A lens should be rejected if these rainbow colors are very pronounced. Spherical aberration may be seen when the lens is removed still further from the page when the letters will appear distinct again but small and upside down. If the lines are straight and not closer together at the ends the lense is of good quality in this respect.

The most important thing in the use of a lens is to see that the point at which one desires to look is in the light. Do not allow the head or the lens to throw a shadow on that which you are endeavoring to examine. The next most important thing is to hold all steady. The best plan is to lay the two hands against each other, one holding the object, the other the lens and bring the cheek against the hand with the eye as close to the lense as possible.

#### USE OF MICROSCOPE.

A microscope provides for the use of higher magnification than a hand lense by provisions for better illumination of the object and for greater steadiness. The object is usually so preparer that light can pass thru the tissue, and it rests on a stage, the lenses being brought into focus by a screw adjustment. In using a microscope observe the following points.

1. See that the slide containing the object is clean, and free from dust and then lay it on the stage of the microscope.

2. Look down the tube and manipulate the mirror till securing the strongest light. If the field is cloudy revolve the eyepiece so as to locate the dirt.

3. Move the object as nearly as possible to position and lower the tube of the microscope till the objective is as close or closer than the focus, doing this with the eye almost on the level of the stage.

4. Bring the eye to the tube again and turn the focusing screw up (never down) till the object comes into view.

If the instrument needs cleaning bring the fact to the attention of the instructor rather than to try to clean it yourself; however the method of cleaning follows: (a.) brush off all dust. (b.) moisten lens with the breath and wipe gently with a clean cloth. (c.) if these means fail slightly moisten a cloth with a drop of alcohol and apply carefully.

#### MICROSCOPICAL MOUNTS.

Microscopical slides are usually made with an aqueous medium or with balsam. Aqueous media are water, sugar solution, mucilage or glycerine jelly. To make these mounts permanent they must be sealed. One of the best method of sealing an aqueous mount is to first mount the preparation between two coverglasses, one much smaller than the other. Now place a drop of balsam on a slide and lay the mount small cover down in the balsam.

Balsam mounts require the removal of the water from the specimen which is usually accomplished by the use of alcohol. The alcohol is then replaced by an oil which in turn is largely replaced by the balsam. The oils most used are xylol, turpentine, clove oil and cedar oil. Carbolic acid is sometimes added to the turpentine. When the object is dry it can be placed at once in the oil or even directly into the balsam.

#### SECTIONING INSECTS.

For the most careful study of the structure of insects sections are cut by the use of a microtome. The following method gives good results:

1. Place the specimens in a two dram hobo vial, not filling it more than a tenth full, and kill by filling with boiling water.

2. Harden tissues with alcohol pouring off  $\frac{1}{4}$  the water and adding alcohol. In half an hour pour off a third and add as much alcohol. An hour later  $\frac{1}{2}$  and the next day put in fresh strong alcohol.

3. Remove the alcohol by soaking a few minutes in oil of cloves and then place in melted paraffine (56 degree.) one or two days, when it is ready to cut.

Square measure — sq. inch 144 sq. foot 9 sq. yard  $31\frac{1}{4}$  sq. rod 160 acre 640 sq. mile

## Cubic Measure.

Cubic measure — cubic inch 1728 cubic foot 27 cubic yard.

Dry measure — pint 2 quart 4 gallon 2 peck 4 bushel.

Fluid measure — minim 60 dram 16 ounce 4 gill 4 pint 2 quart 4 gallon.

Cu. c. m.			Milli- Centi- Deci.			Litre.			Deca- Centi- Deci.			Stere.			Deca- Hecto- Kilo- Myria-		
			Milli- Centi- Deci.	Litre.			Deca- Centi- Deci.			Stere.			Deca- Hecto- Kilo- Myria-				
1	2	1	3	6	9	5	4	1	9	5	2	Minum.					
1	8	3	1	7	2	1	2	9	9	0	4	Imperial.					
4	6	0	2	3	4	5	0	8	1	1	9	Dram.					
9	9	7	3	9	1	6	1	0	2	5	3	Imperial.					
2	4	9	4	6	3	3	3	7	9	8	9	Cu. inch.					
1	1	1	3	3	2	8	1	7	5	7	4	Fluid ounce					
8	2	5	8	2	1	8	4	4	9	7	4	Imperial.					
4	4	0	0	4	1	7	0	4	3	9	3	Gill.					
2	1	3	4	1	2	2	1	1	2	4	3	Imperial.					
9	6	1	3	8	4	9	1	8	1	5	9	Pint.					
6	2	1	9	3	9	5	1	7	6	0	9	Dry.					
2	2	9	8	2	4	6	1	0	5	6	7	Imperial.					
8	2	3	2	1	3	1	1	9	0	7	9	Quart.					
3	6	3	1	2	6	0	1	8	8	0	4	Dry.					
9	6	0	6	0	1	3	2	6	4	1	8	Imperial.					
4	8	3	1	3	9	3	2	2	0	1	2	Gallon.					
1	4	7	2	7	2	7	1	3	2	0	9	Imperial.					
4	4	0	4	2	7	8	3	5	3	1	6	Peck.					
4	9	6	0	6	0	1	2	8	3	7	4	Cubic foot.					
3	4	8	3	1	3	9	2	7	5	1	6	Bushel.					
0	8	1	6	4	3	1	9	1	3	2	9	Imperial.					
												Cubic yard.					

## TERMS USED IN DESCRIPTIONS.

Many of the terms used in describing the parts of insects are derived from the latin and have not come into common use in general literature. The following are among those most used:

**Shape.** — **Arcuate**, curved. **Attenuate**, much narrowed. **Clavate**, club-shaped. **Cordate**, heart-shaped. **Cuneate**, wedge-shaped. **Emarginate**, edge with a large blunt incision. **Falcate**, sickle-shaped. **Incrassate**, swollen. **Lanceolate**, lance-shaped. **Lobate**, with rounded portions produced by deep incisions. **Lunate**, moon-shaped. **Mucronate**, ending abruptly in a sharp point. **Quadrata**, square. **Reniform**, kidney-shaped. **Rotundate**, round. **Sinuate**, edge strongly wavy. **Spatulate**, spatula-shaped. **Subulate**, awl-shaped. **Tri-**

quetral, three-sided. **Truncate**, appearing as if cut off. **Tumid**, swollen.

**Surface**.—**Canaliculate**, with a broad central furrow. **Ciliate**, fringed with hairs. **Coreaceous**, leathery. **Corneous**, horny. **Fasciculate**, with bundles of long hair. **Glabrous**, smooth, free from hairs. **Muricate**, covered with small sharp-pointed elevations. **Pilose**, with abundant rather short erect hair. **Porcate**, with very broad and deep grooves. **Pubescent**, with very fine hairs. **Rugose**, with wrinkles. **Scabrous**, covered with broad flat scales. **Striate**, with fine parallel impressions. **Sulcate**, with rather large grooves. **Tessellate**, checkered. **Tomentose**, with long tangled hairs. **Ventricose**, greatly swollen. **Verrucose**, warty. **Villose**, with long erect hairs.

**Colors**.—**Æneus**, bronze colored. **Brunneus**, a pure bright brown. **Castaneus**, chestnut-brown. **Cinereus**, dark gray. **Cupreus**, copper colored. **Ferrens**, iron gray. **Ferrugineus**, rust red. **Fuliginus**, soot brown. **Fulvus**, light brown. **Fuscus**, dull dark brown. **Glaucus**, a bright blue inclined to gray. **Livid**, a pale yellow. **Lurid**, a dirty yellow inclining to brown. **Luteus**, clay yellow. **Piceus**, pitchy black. **Pruinose**, covered with a whitish bloom. **Sanguineus**, blood red. **Testaceus**, dull yellowish brown.

## FOUR PLACE LOGARITHM TABLE.

The following table of logarithms is designed for rapid percentage determinations. Relative abundance of insects should be given in per cents. The use of such tables is so well understood that no explanations will be necessary.

This table of logarithms differs from others as follows:— 1st. The use of antilogarithms avoids the inaccuracy of the zero end of the table. 2nd. tions. 3rd. The arrangement in columns, the spacing, and the position of the difference columns, are calculated to lessen the danger of error in reading. The use of five digits avoids inaccuracy in the fourth place in interpolation and to contribute to rapidity of work.

			63347	64345	65321	66276	67210	68124	69020	4
			10 448	10 444	10 418	9 370	9 302	9 215	9 108	
			20 548	20 542	19 514	19 464	18 394	18 305	18 197	
			30 649	29 640	29 610	28 558	27 486	27 395	26 285	
			40 749	39 738	39 706	37 652	37 578	36 485	35 373	
			50 849	49 836	48 801	47 745	46 669	45 574	44 461	
			949	933	896	839	761	664	548	
			048	031	992	932	852	753	636	
			147	128	087	025	943	842	723	
0	1	2	246	225	181	117	034	931	810	
0	1	2	3	4	5	6	7	8	9	



0	1	2	3	4	5	6	7	8	9
5 69897	70757	71600	72428	73239	74036	74819	75587	76343	77085 5
9 984	8 842	8 684	8 509	8 320	8 115	8 896	8 664	7 418	7 159
17 070	17 927	17 767	16 591	16 400	16 194	15 974	15 740	15 492	15 232
24 157	25 012	25 850	24 673	24 480	23 273	23 051	23 815	22 567	22 305
34 243	34 096	33 933	32 754	32 560	31 351	31 128	30 891	30 641	29 379
43 329	42 181	41 016	41 835	40 640	39 429	38 205	38 967	37 716	37 452
415	265	099	916	719	507	282	042	790	525
501	349	181	997	799	586	358	118	864	579
586	433	263	078	878	663	435	193	938	670
672	517	346	159	957	741	511	268	012	743
6 77815	78533	79239	79934	80618	81291	81954	82607	83251	83385 6
7 887	7 604	7 309	7 003	7 686	7 358	7 020	7 672	6 315	6 948
14 960	14 675	14 379	14 072	14 754	13 425	13 086	13 737	13 378	12 011
22 032	21 746	21 449	21 140	20 821	20 491	20 151	19 802	19 442	19 073
29 104	28 817	28 518	27 209	27 889	27 558	26 217	26 866	21 506	25 136
36 176	35 888	35 588	34 277	34 956	33 624	33 282	32 930	32 569	31 193
247	958	657	346	023	690	347	995	632	261
319	029	727	414	090	757	413	059	696	323
390	099	796	482	158	823	478	123	759	386
462	169	865	550	224	889	543	187	822	443
7 84510	85126	85733	86332	86923	87506	88081	88649	89209	89763 7
6 572	6 187	8 794	6 392	6 982	6 564	6 138	6 705	7 265	5 818
12 634	12 248	12 854	12 451	12 040	12 632	11 196	11 762	11321	11 873
18 696	18 309	18 914	18 510	17 099	17 680	17 252	17 818	17 376	16 927
25 757	24 370	24 974	24 570	23 157	23 737	23 309	22 874	22 432	22 982
31 819	30 431	30 034	30 629	29 216	29 795	28 366	28 930	28 487	27 037
880	491	094	688	274	852	423	986	542	091
942	552	153	747	332	910	480	042	597	146
003	612	213	806	390	967	536	098	653	210
065	673	273	864	448	024	593	154	708	255
8 90309	90849	91381	91908	92428	92942	93450	93952	94448	94939 8
5 363	5 902	5 434	5 960	5 489	5 993	5 500	5 002	5 498	5 988
11 417	11 956	11 487	10 012	10 531	10 044	10 551	10 052	10 547	10 036
16 472	16 009	16 540	16 065	15 583	15 095	15 601	15 101	15 596	15 085
22 526	21 062	21 593	21 117	21 634	20 146	20 651	20 151	20 645	19 134
27 580	27 116	26 645	26 169	26 686	25 197	25 702	25 201	25 694	24 182
634	169	698	221	737	247	752	250	743	231
687	222	751	273	788	298	802	300	792	279
741	275	803	324	840	349	852	349	841	328
795	328	855	376	891	399	902	399	890	376
9 95424	95904	96379	96848	97313	97772	98227	98677	99123	99563 9
5 472	5 952	5 426	5 895	5 359	5 818	5 272	4 722	4 167	4 607
10 521	10 999	9 473	9 942	9 405	9 864	9 318	9 767	9 211	9 651
14 569	14 047	14 520	14 988	14 451	14 909	14 363	13 811	13 255	13 695
19 617	19 095	19 567	19 035	18 497	18 955	18 408	18 856	18 300	17 739
24 665	24 142	24 614	23 081	23 543	23 000	23 453	22 900	22 344	22 782
713	190	661	128	589	046	498	945	388	826
761	237	708	174	635	091	543	989	432	870
809	284	755	220	681	137	588	034	476	913
856	332	802	267	727	182	632	078	520	957
0	1	2	3	4	5	6	7	8	9

## ANTI-LOGARITHMS.

0	1	2	3	4	5	6	7	8	9	
0 10000	10233	10471	10715	10965	11220	11482	11749	12023	12303	0
2 023	2 257	2 495	2 740	3 990	3 246	3 508	3 776	3 050	3 331	
5 046	5 280	5 520	5 765	5 015	5 272	5 535	5 803	5 078	6 359	
7 069	7 304	7 544	7 789	8 041	8 298	8 561	8 830	8 106	9 388	
9 093	10 328	10 568	10 814	10 066	10 324	11 588	11 858	11 134	11 417	
12 116	12 351	12 593	12 839	13 092	13 350	13 614	14 885	14 162	14 445	
139	375	617	864	117	376	641	912	190	474	
162	399	641	889	143	402	668	940	218	503	
186	423	641	914	169	429	695	967	246	531	
209	447	691	940	194	455	722	995	274	560	
1 12589	12882	13183	13490	13804	14125	14454	14791	15136	15488	1
3 618	3 912	3 213	3 521	3 836	3 158	3 488	3 825	4 171	4 524	
6 647	6 942	6 243	6 552	6 868	7 191	7 521	7 859	7 205	7 560	
9 677	9 972	9 274	9 583	10 900	10 223	10 555	10 894	11 241	11 596	
12 706	12 002	12 305	13 614	13 932	13 256	13 588	14 928	16 276	19 631	
15 735	15 032	15 335	16 646	16 964	16 289	17 622	17 962	18 311	18 688	
764	062	366	677	996	322	655	997	346	704	
794	092	397	709	028	355	689	031	382	740	
823	122	428	740	060	388	723	066	417	776	
853	152	459	772	093	421	757	101	453	812	
2 15849	16218	16596	16982	17378	17783	18197	18621	19055	19498	2
4 885	4 255	4 634	4 022	4 418	4 824	4 239	4 664	4 099	5 543	
7 922	8 293	8 672	8 061	8 458	8 865	8 281	9 707	9 143	9 588	
11 922	11 331	12 711	12 100	12 498	12 906	13 323	13 750	13 187	14 634	
15 996	15 368	15 749	16 140	16 539	17 947	17 365	17 793	18 231	18 679	
18 032	19 406	19 788	20 179	20 579	21 989	21 408	22 836	22 275	22 724	
069	444	827	219	620	030	450	880	320	770	
106	482	866	258	660	072	493	923	364	815	
144	520	904	298	701	113	535	967	409	861	
181	588	943	338	742	155	578	011	454	907	
3 19953	20417	20893	21380	21878	22387	22909	23442	23988	24547	3
5 999	5 464	5 941	5 429	5 928	5 439	5 962	5 496	6 044	6 604	
9 045	10 512	10 989	10 478	10 979	10 491	11 014	11 550	11 099	11 660	
14 091	14 559	15 038	15 528	15 029	16 542	16 037	16 605	17 155	17 717	
19 137	19 606	19 086	20 577	20 080	21 594	21 121	22 659	22 210	23 774	
23 184	24 654	24 135	25 627	25 131	26 646	27 174	27 714	27 266	28 831	
230	701	184	677	182	699	227	768	322	889	
277	749	232	727	233	751	231	823	378	946	
324	797	281	777	284	803	335	878	434	003	
370	845	330	827	336	856	388	933	491	061	
4 25119	25704	26303	26915	27542	28184	28840	29512	30200	30903	4
6 177	6 763	6 363	6 977	6 606	7 249	7 907	7 580	7 269	7 974	
12 235	12 823	12 424	13 040	13 659	13 314	13 973	14 648	14 339	14 046	
18 293	18 882	18 485	19 102	19 733	20 379	20 040	21 717	21 409	22 117	
23 351	24 942	24 546	25 164	26 797	27 445	27 107	28 785	28 479	29 189	
29 410	30 002	31 607	31 227	32 861	33 510	34 174	34 854	35 549	36 261	
468	062	669	290	925	576	242	923	620	333	
527	122	730	353	990	642	309	992	690	405	
586	182	792	416	054	708	377	061	761	477	
645	242	853	479	119	774	444	130	832	550	
0	1	2	3	4	5	6	7	8	9	

	0	1	2	3	4	5	6	7	8	9
5	31623	32359	33113	33884	34674	35481	36308	37154	38019	38905 5
7	696	8 434	8 189	8 963	8 754	8 563	8 392	9 239	9 107	9 994
15	769	15 509	15 266	16 041	16 834	17 645	17 475	17 325	18 194	18 084
23	842	23 584	23 343	24 119	24 914	25 727	25 559	26 411	27 282	27 174
29	915	30 659	31 420	32 198	32 995	33 810	34 644	35 497	35 371	36 264
38	989	38 734	39 497	40 277	40 075	41 892	42 728	43 584	49 459	45 355
	063	810	574	356	156	975	813	670	584	446
	137	885	651	435	237	058	898	757	637	537
	11	961	729	514	318	141	983	844	726	628
	285	037	806	594	400	224	068	932	815	719
6	39811	40738	41687	42658	4	5	6	7	8	9
9	902	9 832	10 783	10 756						
19	994	19 926	19 879	20 855						
28	087	28 020	29 976	30 954						
37	179	38 115	39 073	40 053						
46	272	47 210	49 170	50 152						
	365	305	267	251						
	458	400	364	351						
	551	495	462	451						
	644	591	560	551						
	0	1	2	3						

A plan for indexing notes or books is given below. A few examples will render the use of these tables clear. This book would be indicated by In—choCal which would mean a catalogue with synopses and helps for the study of the insects of California. A textbook on zoology would be marked z—h, A list of the sphingidæ of the United States is indicated by InSp—cU

PRIMARY DIVISIONS. (One or two letter the initial a capital.)

Art. 2. Accounts. Administration. Agriculture. Algebra. Amusements, Anthropology. Architecture. Astronomy.  
 Biography. 2. Banking. Beverages. Biology. Bleaching. Botany. Building.  
 Chemistry. 2. Calculus. Ceramics. Church. Commerce. Customs. Domestic economy. 2. Dentistry. Dichotyledons. Drawing. Dyeing  
 Engineering. 2 Ecology. Education: Electricity. Embryology. Engraving. Ephemerides. Eschatology. Ethics. Evolution.  
 Fiction. 2 Factories. Finance. Forestry.  
 Government. 2. Geology.  
 History. 2. Heat. Horticulture. Humor. Hymnology.  
 Industries. 2. Immigration. Insects. Irrigation.  
 Juvenile. 2. Jurisprudence.  
 Kinematics.  
 Literature. 2. Landscape gardening. Library science. Logic.  
 Medicine. 2. Mathematics. Mechanics. Mining. Morphology. Music.  
 Nature. 2. Numbers.  
 Occultism. 2. Obstetrics. Oils. Optics. Orchestra.

Physics. 2. Painting. Petrography. Philosophy. Piano. Plumbing Politics. Printing. Psychology. Pyrotecnics.  
 Religion. 2. Roofing.  
 Sociology. 2. Sacraments. Sculpture. Ship building. Slavery. Socialism. Specifications. Statistics. Sufrage. Synthesis.  
 Technology. 2. Taxes. Temperance. Theology. Transportation.  
 War. 2. Women.  
 Xylography.  
 Yachting.  
 Zoology. 2. Zootechny.

## FORM DIVISIONS. (small letter following —.)

addresses. (lectures, essays, papers, tracts, letters, etc.)  
 bibliography.  
 catalogs.  
 dictionaries. (lexicons.)  
 encyclopedias. (collected works.)  
 figures. (illustrations.)  
 helps (study, schools, etc.)  
 indexes. (concordances.)  
 journals. (magazines, newspapers, reviews, periodicals etc.)  
 libraries.  
 museums. (exhibitions.)  
 note. (brief mention.)  
 outlines. (compendis, tabular view, synopses, charts, etc.)  
 philosophy. (theory.)  
 questions. (catechisms.)  
 reports (of institutions or associations.)  
 statistics.  
 utility. (economics.)

## GEOGRAPHICAL DIVISIONS. (Following form abbreviations.)

Asia. 2. Abyssinia. Africa. Alaska. Anhalt. Argentina. Assiniboia. Athabasca. Austria-Hungary. Azores. 3. Afghanistan. Alabama. Alberta. Algeria. Alsace-Lorraine. Andorra. Antarctic region. Arctic region. Arabia. Arizona. Arkansas. Australia. 4. Austria.(kingdom.)  
 Brazil. 2. Baluchistan. Bc. (British Columbia.) Belgium. Bolivia. British East Africa. Burma. 3. Baden. Bavaria. Bermudas. Bohemia. Borneo. Bosnia. Bremen. British South Africa. Brunswick. Bukowina. Bulgaria. 4. British Honduras.  
 China. 2. Canada. Central America. Chile. Columbia. Croatia and Slavonia. Cuba. Cv. (Cape Verde Islands.) 3. California. Canary Islands. Cape Colony. Carinthia. Celebes Islands. Ceylon. Coastland. Colorado. Connecticut. Corsica. Costa Rica. Crete. 4. Carniola.  
 Denmark. 2. Dalmatia. Delaware. District of Columbia.  
 Europe. 2. Ecuador. Egypt. England.

- France. 2. Falkland Islands. Fiji Islands. Florida. French Indo-China.  
3. Fiume.
- Germany. 2. Galicia. German East Africa. Great Britain. Guatamala.  
3. Georgia. German South West Africa. Greece. Gub. (Guiana, British.)  
Gud. (Guiana, Dutch.) Guf. (Guiana, French.) 4. Greenland.
- Hungary. 2. Haiti. Herzegovinia. Honduras. 3. Hamburg. Hawaiian  
Islands. Hesse.
- India. 2. Iceland. Idaho. Illinois. Indiana. Iowa. Ireland. Italy,  
Japan. 2. Java. 3. Jamaica.
- Kongo Free State. 2. Kamerun. Keewatin. Kongo (French.) 3. Kan-  
sas. Kentucky. Korea.
- Liberia. 2. Lippe. Lower Austria. Luxemburg. 3. Lichtenstein. Lou-  
isiana. Lubek.
- Mexico 2. Madagascar. Me. (Maine.) Michigan. Mn. (Mecklenburg  
Schwerin.) Mo. (Missouri.) Mz. (Mecklenburg Stralitz.) 3. Mackenzie  
Madeira Islands. Manitoba. Maryland. Massachusetts. Minnesota. Mis-  
sissippi. Montana. Morocco. 4. Montenegro. Moravia.
- North America. 2. Natal. Nb. (New Brunswick.) Nc. (North Carolina.)  
Nd. (North Dakota.) Netherlands. Nf. (New Foundland.) Ng. (New  
Guinea.) Nh. (New Hampshire.) Nicaragua. Nj. (New Jersey.) Nm.  
(New Mexico.) Norway. Ns. (New South Wales.) Ny. (New York.) Nz.  
(New Zealand.) 3. Nebraska. Nevada. Nova Scotia. 4. Novibazar.
- Oceanica. 2. Obok. Ohio. Oklahoma Oldenburg. Oman. Ontario Oregon.  
3. Orange Free State.
- Persia. 2. Paraguay. Peru. Philippines. Portugal. Prussia, 3. Pana-  
ma. Pennsylvania. Poe. (Portuguese East Africa.) Pog. (Portuguese  
Guinea.) Poland. Porto Rico. Pow. (Portuguese West Africa.)
- Queensland. 2. Quebec.
- Russia. 2. Reuss Gera Schleiz. Rhodesia. Roumania. 3. Reuss Griez.  
Rumelia.
- South America. 2. Saskatchewan. Sc. (South Carolina.) Cd. (South Da-  
kota.) Servia. Siberia. South Australia. Spain. Styria. Sumatra. Sweden.  
3. Salvador. Samoa. Santo Domingo. Sardinia Saxony. Scotland. Siam.  
Sicily. Sierra Leone. Somali Coast. Straits Settlement. Switzerland. 4.  
Salzburg. Smaos. San Marino. Saxa. (Saxe Altenburg.) Saxc. (Saxe Co-  
burg.) Saxm. (Saxe Meiningen.) Saxw. (Saxe Weimar Eisenach.) Schl.  
(Schaumburg Lippe.) Schr. Schwartzburg Rudolphstat.) Schs.  
(Schwartzburg Sandershausen.)
- Turkey. 2. Tasmania. Texas. Tripoli. Tunis. Tyrol. 3. Tennessee  
Transvaal.
- United States. 2. Ungava. Upper Austria. Uruguay. Utah.
- Venezuela. 2. va. (Virginia.) Vermont. Victoria. Vorarlberg.
- West Australia. 2. Wales. West Virginia. Wisconsin. Wuerttemberg.  
Wyoming. 3. Waldeck. Washington.
- Yucón. 2. Yellowstone Park. Yosemite Park.

#### SUBDIVISIONS OF INSECTS.

- Aptera. 2. Acrididæ. Æschnidæ. Agapetidæ. Aleurodidæ. Amphizoidæ.  
Anthophoridæ. Apidæ. Arctiidæ. Asilidæ. Atropidæ. 3. Ægialyt-



- idæ. *Æolothripidæ*. *Agaristidæ*. *Agromyzidæ*. *Alysiidæ*, *Andrenidæ*, *Anisotomidæ*, *Anobiidæ*, *Anthicidæ*, *Aphidæ*, *Apioceridæ*, *Aradidæ*. 4. *Agaonidæ*, *Agrionidæ*, *Anthomyidæ*, 5. *Anthribidæ*, *Anthocoridæ*.
- Bombylidæ*. 2. *Belostomidæ*, *Bibionidæ*, *Blastobasidæ*, *Bombidæ*, *Brachonidæ*, *Buprestidæ*, *Byrrhidæ*. 3. *Bembecidæ*, *Berytidæ*, *Blattidæ*, *Blepharoceridæ*, *Bombycidæ*, *Borboridæ*, *Bostrychidæ*, *Bruchidæ*, *Byturidæ*.
- Coleoptera*. 2. *Carabidæ*, *Cerambycidæ*, *Chrysomelidæ*, *Cicindelidæ*, *Cleridæ*, *Corrodentia*, *Crabronidæ*, *Culicidæ*, *Cynipidæ*. 3. *Calandridæ*, *Calandridæ*, *Campodidæ*, *Capsidæ*, *Cecidomyidæ*, *Cephidæ*, *Ceratinidæ*, *Chironomidæ*, *Chrysididæ*, *Cicadidæ*, *Cimbycidæ*, *Cistelidæ*, *Clambidæ*, *Cleonidæ*, *Coccidæ*, *Colletidæ*, *Conopidæ*, *Coreidæ*, *Cossidæ*, *Cryptophagidæ*, *Cucujidæ*, *Cupesidæ*, *Curculionidæ*, *Cydnidæ*, *Cyrtidæ*. *Calamoceratidæ*, *Calopterygidæ*, *Cercopidæ*, *Ceroptridæ*, *Chrysididæ*, *Cimicidæ*, *Cisidæ*, *Clavigeridæ*, *Coccinellidæ*, *Colydiidæ*, *Coniopterygidæ*, *Corimelanidæ*, *Corylophidæ*, *Cordulidæ*. 5. *Cerophytidæ*, *Corisidæ*, *Cordulegasteridæ*.
- Diptera*. 2. *Dasyllidæ*, *Dermestidæ*. *Diopridæ*, *Dolichopidæ*, *Drosophilidæ*, *Dytiscidæ*. 3. *Dexiidæ*, *Dolcridæ*.
- Ephemerida*. 2. *Elateridæ*, *Empidæ*, *Endomychidæ*, *Ephydridæ*, *Erotylidæ*, *Eumenidæ*, *Evaniidæ*. 3. *Elachistidæ*, *Embiidæ*, *Encyrtidæ*, *Eucharidæ*, *Eulophidæ*, *Eurytomidæ*. 3. *Eucnemidæ*.
- Formicidæ*. 2. *Figitidæ*, *Forficulidæ*, *Fulgoridæ*.
- Geometridæ*. 2. *Galgulidæ*, *Gelechiidæ*, *Gomphidæ*, *Gryllidæ*, *Gyrinidæ*. 3. *Geomyzidæ*, *Gerridæ*, *Gyropidæ*. 4. *Georyssidæ*.
- Hymenoptera*. 2. *Halipidæ*, *Hemiptera*, *Histeridæ*, *Hydrophilidæ*. 3. *Helomyzidæ*, *Henicocephalidæ*, *Hepialidæ*, *Hesperidæ*, *Heteroceridæ*, *Hippoboscidæ*, *Hydroscephidæ*, *Hylatomidæ*, *Hyponomeutidæ*. 4. *Helodidæ*, *Hemero-biidæ*, *Hydropsychidæ*.
- Ichneumonidæ*. 2. *Ipidæ*, *Ithomiidæ*.
- Jassidæ*. 2. *Japygidæ*.
- Lepidoptera*. 2. *Lathrididæ*, *Leptidæ*, *Libellulidæ*, *Locustidæ*, *Lycænidæ*. 3. *Lagriidæ*, *Lariidæ*, *Lasiocampidæ*, *Lecanidæ*, *Lepismidæ*, *Limnephilidæ*, *Liotheidæ*, *Liparidæ*, *Lithosiidæ*, *Lonchopteridæ*, *Lophyridæ*, *Lyctidæ*, *Lygæidæ*, *Lymnadidæ*. 4. *Larridæ*, *Lipuridæ*.
- Mutillidæ*. 2. *Malachidæ*, *Meloidæ*, *Miscogasteridæ*, *Mordellidæ*, *Muscidæ*, *Myrmeleonidæ*. 3. *Machilidæ*, *Marsaridæ*, *Mantidæ*, *Megachilidæ*, *Melandyridæ*, *Membracidæ*, *Micropterygidæ*, *Monotomidæ*, *Mycetophagidæ*, *Mydaidæ*, *Mymaridæ*, *Myzinidæ*. 4. *Mantispidæ*, *Micropezidæ*, *Monommidæ*, *Mycetophilidæ*.
- Neuroptera*. 2. *Naucoridæ*, *Nematidæ*, *Nitidulidæ*, *Noctuidæ*, *Nymphalidæ*. 3. *Nabidæ*, *Nepidæ*, *Nolidæ*, *Nomadidæ*, *Notodontidæ*, *Nycteolidæ*, *Nyssonidæ*. 4. *Notonectidæ*.
- Orthoptera*. 2. *Odonata*, *Cecophoridæ*, *Ortalidæ*, *Oscinidæ*, *Otiiorhynchidæ*, *Oxybelidæ*. 3. *Odontoceridæ*, *Cedemeridæ*, *Cestridæ*, *Orneodidæ*, *Oryssidæ*, *Ostomiidæ*, *Othniidæ*.
- Pyrallidæ*. 2. *Papilionidæ*, *Pentatomidæ*, *Phlopterygidæ*, *Pieridæ*, *Platypterygidæ*, *Proctotrypidæ*, *Pselaphidæ*, *Ptinidæ*, *Pulicidæ*, *Pyrallidæ*. 3. *Pamphiliidæ*, *Panurgidæ*, *Parnasiidæ*, *Pediculidæ*, *Pelicinidæ*, *Pemphredonidæ*, *Pericopidæ*, *Platypezidæ*, *Philanthidæ*, *Phlæothripidæ*, *Phoridæ*, *Pipunculidæ*, *Prosopidæ*, *Psamocharidæ*, *Psocidæ*, *Psychodidæ*, *Pterophoridæ*, *Ptiliidæ*, *Pyrrhocoridæ*, *Pythidæ*. 4. *Panorpidæ*, *Parnidæ*, *Perlidæ*, *Phasmidæ*,

Phalacridæ, Psoidæ, Psychomyidæ, Pteromalidæ, Pteromalidæ, Pyrochroidæ. 5. Psychidæ.

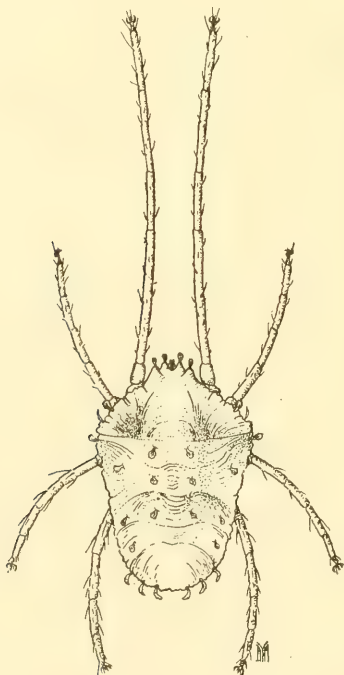
Reduviidæ. 2. Raphidiidæ, Rhynchidæ, Riordinidæ. 3. Rhinomaceridæ, Rhysacophilidæ. 4. Rhipiphoridæ, Rhysodidæ. 5. Rhipiceridæ.

Staphylinidæ. 2. Saturniidæ, Scarabæidæ, Sessiidæ, Simuliidæ, Smynthuridæ, Sphingidæ, Strttiomyidæ, Syrphidæ. 3. Saldidæ, Eapromyzidæ, Sarcophagidæ, Scatophagidæ, Scenopidæ, Sciomyzidæ, Scoliidæ, Scutelleridæ, Scydmanidæ, Selandriidæ, Sepsidæ, Sercosomatidæ, Sialidæ, Siricidæ, Sphegidæ, Spondylidæ, Stephanidæ, Stizidæ, Stylopidæ, Syntomidæ. 4. Sapygidæ, Sarcopsyllidæ, Scaphidiidæ, Sphæridæ, Sphindidæ.

Tenebrionidæ. 2. Tachinidæ, Tenthredinidæ, Thripidæ, Tineidæ, Tortricidæ, Trypetidæ. 3. Tabanidæ, Tenipedidæ, Termitidæ, Tendipedidæ, Termitidæ, Therevidæ, Thinnidæ, Throscidæ, Thyatiridæ, Tipulidæ, Tingidæ, Torymidæ, Trichopterygidæ, Thyatiridæ, Trypoxylidæ. 4. Thyridæ, Tiphidæ, Thyridæ, Tiphidæ, Tiphidæ, Trichodectidæ.

Vespidæ. 2. Veliidæ,

Xylocopidæ. 2. Xylorictidæ,







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